Volume 7 Number 1 2005

AUSTROBAILEYA

A Journal of Plant Systematics

Queensland Herbarium

Queensland Government
Environmental Protection Agency

SHOUT
SHARE
IT

Volume 7 Number 1 2005

AUSTROBAILEYA

A Journal of Plant Systematics

Queensland Herbarium

Queensland Government
Environmental Protection Agency

Editorial Committee

P.I. Forster (editor)
P.D. Bostock (technical advisor)
G.P. Guymer (technical advisor)

Desktop Publishing

Murray Henman
Yvonne Smith
Peter Bostock

Austrobaileya

Vol. 1, No. 1 was published on 1 December 1977
Vol. 6, No. 4 was published on 6 December 2004
This volume (vol. 7, no. 1) published 21 December 2005

Austrobaileya is published once per year.

Exchange: This journal will be distributed on the basis of exchange.

Australian Subscribers: Orders for single issues and subscriptions may be placed. The price is (GST included): AUD$35.00 per issue for individuals, AUD$55.50 for institutions, including postage.

Overseas Subscribers: Orders for single issues and subscriptions may be placed. The price is (2005): AUD$35.00 per issue for individuals, AUD$48.00 for institutions, including postage.

All correspondence relating to exchange, subscriptions or contributions to this journal should be addressed to: The Editor, Austrobaileya, Queensland Herbarium, Environmental Protection Agency, Brisbane Botanic Gardens, Mt Coot-tha Road, Toowong, Queensland 4066, Australia. Email: paul.forster@epa.qld.gov.au

ISSN 0155-4131

© Queensland Herbarium 2005

Web site: www.epa.qld.gov.au/herbarium

Austrobaileya is the journal of the Queensland Herbarium and publishes peer-reviewed research on plants, algae, fungi and lichens (systematics, morphology, geography, anatomy, karyology, conservation biology and botanical history), with special emphasis on taxa from Queensland.

Opinions expressed by authors are their own and do not necessarily represent the policies or view of the Queensland Herbarium.

Contents

Studies in Euphorbiaceae, *s.lat.* 6. A revision of the genus *Poranthera* Rudge (*Antidesmeae*, *Porantherinae*) in Australia
D.A. Halford & R.J.F. Henderson 1–27

A taxonomic revision of *Tarenna* Gaertn. and *Triflorensia* S.T.Reynolds (Rubiaceae: *Ixoroideae*: *Pavetteae*) in Australia
S.T. Reynolds & P.I. Forster 29–55

A taxonomic revision of *Actephila* Blume (Euphorbiaceae/Phyllanthaceae) in Australia
P.I. Forster 57–98

Studies in Australian Myrsinaceae: *Tapeinosperma* Hook.f.
B.R. Jackes 99–110

Notes on the narrow-leaved Ironbarks (Myrtaceae: *Eucalyptus* subseries *Subglaucae*)
A.R. Bean 111–120

Backhousia enata A.J.Ford, Craven & J.Holmes (Myrtaceae), a new species from north–eastern Queensland
A.J. Ford, L.A. Craven & J.J. Brophy 121–127

Bazzania sauropoda D.Meagher (Marchantiophyta: Lepidoziaceae), a new species from tropical Queensland
D. Meagher 129–133

Gyrostemon osmus Halford (Gyrostemonaceae), a new species from south–eastern Queensland
D.A. Halford 135–139

Eucalyptus erosa A.R.Bean (Myrtaceae), a new stringybark species from central Queensland
A.R. Bean 141–144

Rediscovery and neotypification of *Marsdenia arachnoidea* Schltr. (Apocynaceae: *Asclepiadoideae – Marsdenieae*), an endangered species from Papua New Guinea
P.I. Forster & W. Takeuchi 145–150

Ludwig Leichhardt's Australian Plant Collections, 1842–1847
J.L. Dowe 151–163

Wing structure in seeds of *Strangea* Meisn. and *Stenocarpus* R.Br. (Proteaceae)
H.T. Clifford & M.E. Dettmann 165–170

The rediscovery of *Boronia inflexa* subsp. *grandiflora* (Rutaceae)
M.F. Duretto, P. Grimshaw & K. Sparshott 171–173

New species of *Philotheca* Rudge (Rutaceae) from Queensland
P.I. Forster 175–181

Papuasian Orchid Studies, 2
P. Ormerod 183–203

Goodenia elaiosoma I.D.Cowie (Goodeniaceae), a new species from the Top End of the Northern Territory and a key to the northern species
I.D. Cowie 205–213

(*continued*)

Studies in Euphorbiaceae, *s.lat.* 7. *Shonia* R.J.F.Hend. & Halford (*Ricinocarpeae, Ricinocarpinae*), a new Australian endemic genus
D.A. Halford & R.J.F. Henderson 215–228

Cycas scratchleyana F.Muell. (Cycadaceae), a new species record for Queensland and Australia
P.I. Forster 229–230

New species of *Commersonia* J.R.Forst. & G.Forst. (Sterculiaceae) from Eastern Australia and Vanuatu
G.P. Guymer 231–250

Orthographic corrections 251

Studies in Euphorbiaceae *s.lat.* 6. A revision of the genus *Poranthera* Rudge (*Antidesmeae, Porantherinae*) in Australia

David A. Halford & Rodney J.F. Henderson

Summary

Halford, D.A. & Henderson, R.J.F. (2005). Studies in Euphorbiaceae *s.lat.* 6. A revision of the genus *Poranthera* Rudge (*Antidesmeae, Porantherinae*) in Australia. *Austrobaileya* 7(1): 1–27. The genus *Poranthera* Rudge is revised for Australia. *Oreoporanthera* Hutch. is accepted as a taxonomic synonym of *Poranthera*. Fourteen species of *Poranthera* are recognised in Australia and a key is provided for their identification. The following are described here as new: *P. dissecta* Halford & R.J.F.Hend., *P. florosa* Halford & R.J.F.Hend., *P. leiosperma* Halford & R.J.F.Hend., *P. obovata* Halford & R.J.F.Hend. and *P. oreophila* Halford & R.J.F.Hend. The new combination *P. petalifera* (Orchard & J.B.Davies) Halford & R.J.F.Hend., based on *Oreoporanthera petalifera* Orchard & J.B.Davies, is made. New species are illustrated, all species are described and distribution maps provided, and notes on their distribution, habitat and phenology are given. Lectotypes are chosen for *P. microphylla* var. *intermedia* Müll.Arg. and *P. arbuscula* Sond. *Poranthera coerulea* Schwarz is neotypified.

Key Words: Euphorbiaceae, *Poranthera*, *Oreoporanthera*, Australian flora, taxonomy, nomenclature

D.A.Halford and R.J.F. Henderson, c/- Queensland Herbarium, Environmental Protection Agency, Brisbane Botanic Gardens, Mt Coot-tha Road, Toowong, Queensland 4066, Australia.

Introduction

Poranthera Rudge, as accepted here, is a genus of fifteen species that are annuals or herbaceous perennials. The genus has representatives in all Australian states as well as in New Zealand, with thirteen of the species endemic in Australia and one endemic in New Zealand. Centres of diversity are found in south-eastern Australia and south-western Western Australia. The species endemic in New Zealand is *P. alpina* Cheeseman ex Hook.f. which is not dealt with here. A description of this species is given in Cheeseman (1925).

Webster (1994) included *Poranthera* Rudge, as well as *Oreoporanthera* Hutch., in Euphorbiaceae subfamily *Phyllanthoideae* Ascherson, tribe *Antidesmeae* (Sweet) Hurusawa, subtribe *Porantherinae* (Müll.Arg.) Köhler.

The genus *Poranthera* was established by Rudge in 1811 to include a single species, *P. ericifolia* Rudge, based on material collected from Port Jackson, New South Wales (Rudge, 1811). The generic name is derived from Greek *poros*, pore, and *anthera*, anther, in reference to the species' anther cells dehiscing by terminal pores. In his protologue of the genus and species, Rudge mistakenly described its flowers as lacking a calyx. He was apparently deceived by the petaloid nature of their calyx lobes and was not aware of the presence of small, inconspicuous petals within the calyx whorl.

Over the subsequent 55 years, another nine species of *Poranthera* were described by various authors. Brongniart (1833) described *P. microphylla* and *P. corymbosa*, Klotzsch (1848) described *P. drummondii, P. ericoides, P. glauca, P. huegelii and P. piceoides* and Sonder (1857) described *P. arbuscula* while Baillon (1858) described *P. linearoides*, the name of which is an illegitimate synonym of *P. corymbosa*.

Later, Baillon (1866) and Müller (1866) independently accepted *Poranthera* as containing only six species and both placed *P. drummondii, P. piceoides* and *P. arbuscula* in synonymy under *P. microphylla, P. ericoides* and *P. corymbosa* respectively. Müller (*loc. cit.*), however, also recognised seven varieties; *P. corymbosa* var. *arbuscula* (Sond.) Müll.Arg., *P. corymbosa* var. *genuina* Müll.Arg. (= *P. corymbosa* Brongn. var. *corymbosa*), *P. microphylla* var. *diffusa* Müll.Arg., *P. microphylla* var. *drummondii* (Klotzsch)

Accepted for publication 30 June 2005

Müll.Arg., *P. microphylla* var. *genuina* Müll.Arg. (= *P. microphylla* Brongn. var. *microphylla*), *P. microphylla* var. *glauca* Müll.Arg. and *P. microphylla* var. *intermedia* Müll.Arg. Seven years later, Bentham (1873), in his account of *Poranthera* in *Flora Australiensis*, accepted only five species in the genus, combining *P. glauca* with *P. ericoides*.

In the most recent comprehensive work on *Poranthera*, Grüning (1913) recognised the five species Bentham enumerated, re-instated *P. drummondii* as a species distinct from *P. microphylla*, distinguished a number of varieties in *P. microphylla* and *P. corymbosa* and included *P. alpina*, a species described by Hooker (1881) from New Zealand. Grüning was the first to formally divide *Poranthera* into subgeneric groups describing *Poranthera* subgen. *Euporanthera* Grüning (= *Poranthera* subgen. *Poranthera*), characterised by having flowers of both sexes possessing petals and in terminal racemose or corymbose inflorescences, and with stipules thin and membraneous, and *Poranthera* subgen. *Oreoporanthera* Grüning, distinguished by its flowers lacking petals, being solitary and axillary, and with stipules more or less leathery. Since Grüning's treatment, two other species have been described, namely *P. triandra* (Black 1916) and *P. coerulea* (Schwarz 1927).

The genus *Oreoporanthera* was erected by Hutchinson in 1969 to accommodate the species from subalpine communities on the South Island of New Zealand previously known as *Poranthera alpina* Cheeseman ex Hook.f. (Hutchinson 1969). He distinguished *Oreoporanthera* from *Poranthera* by its dioecious habit, arrangement of flowers singly in upper leaf axils, opposite leaves with strongly recurved margins, and by its flowers which lacked petals in both sexes and a vestigial ovary in male flowers. Orchard & Davies (1985) added a second species, *O. petalifera*, to this genus. In their discussion, they noted that their newly described species, although closely related to *O. alpina*, disagreed with Hutchinson's description of the genus in having petals in male and female flowers and a vestigial ovary in male flowers. The new species described in this paper as *P. oreophila*, is similiar to *O. alpina* and *O. petalifera* in its dioecy and strictly opposite leaves with strongly recurved margins. However, its flowers are borne in short dense terminal racemes. There is also a high-altitude form of *P. microphylla* occurring in the Australian Alps which resembles *P. oreophila* in having opposite leaves with more or less strongly revolute margins, but it differs from both those in its monoecy. It is our opinion that the distinctions used to separate *Oreoporanthera* from *Poranthera* are extremely tenuous. We therefore concur with Webb *et al.* (1988) that the separation of *Oreoporanthera* from *Poranthera* cannot be upheld and that the species concerned are best placed in a single genus named *Poranthera*.

No formal subgeneric classification is followed in this revision though two informal groups can be recognised based on habit. These are either small annuals or small herbaceous perennials with annual stems dying back to a more or less woody rootstock (*P. microphylla*, *P. dissecta*, *P. drummondii*, *P. triandra*, *P. coerulea*, *P. leiosperma*, *P. petalifera*, *P. florosa* and *P. oreophila*) or comparatively large annuals or perennials with ± woody stems (*P. ericifolia*, *P. huegelii*, *P. corymbosa*, *P. obovata* and *P. ericoides*).

Materials and methods

The present study involved examination of herbarium specimens by both authors, together with field investigations by the second author from 1988 to 1992. Altogether, approximately 1100 specimens have been examined and annotated. These comprise collections from the following herbaria: AD, BRI, CANB, DNA, HO, K, LD, MEL, NE, NSW, P and PERTH. The above acronyms and ones used in the text are those given by Holmgren *et al.* (1990). Author abbreviations follow Brummitt & Powell (1992). All specimens cited have been examined unless indicated as unseen *n.v.* (*non visus*).

The species treated in the present paper are listed alphabetically. Descriptions of taxa were made from dried herbarium specimens, material preserved in 70% ethanol or dried material reconstituted by placing in boiling water for a few minutes. Measurements listed are based upon the total variation observed in the herbarium specimens examined. Colour of fresh

vegetative and floral parts, where given, are either from herbarium label notes or from photographs taken by the second author during field studies. Plant size, habit, flowering and fruiting times, and habitat data were obtained from herbarium labels. The morphological data for this revision were recorded using the DELTA system (Dallwitz *et al.* 1993). The distribution maps were produced with MapInfo Version 3 and are based on herbarium specimen locality data.

Taxonomy

Poranthera Rudge, *Trans. Linn. Soc. London* 10: 301-303 (1811); *Poranthera* Rudge subgen. *Poranthera*, Grüning in A. Engler, *Pflanzenr.* H.58: 16 (1913); *Poranthera* subgen. *Euporanthera* Grüning in A. Engler, *Pflanzenr.* Heft 58: 16 (1913), *nom. inval.* **Type:** *P. ericifolia* Rudge.

Poranthera subgen. *Oreoporanthera* Grüning in A. Engler, *Pflanzenr.* Heft 58: 21 (1913). **Type:** *Poranthera alpina* Cheeseman ex Hook.f.

Oreoporanthera Hutch., *Amer. J. Bot.* 56(7): 747 (1969). **Type:** *O. alpina* (Cheeseman ex Hook.f.) Hutch., *P. alpina* Cheeseman ex Hook.f.

Annuals or herbaceous perennials, monoecious or rarely dioecious, glabrous. Stems terete, erect, ascending, procumbent, decumbent or prostrate, leafy. Leaves stipulate, sessile or petiolate, alternate or opposite, entire. Stipules persistent, conspicuous, white, membraneous, entire or deeply lobed. Flowers pedicellate, solitary in upper leaf axils or in short dense terminal racemes that are sometimes umbel-like; racemes usually with several male and female flowers, solitary or several in a leafy terminal corymbose inflorescence, bracteate; bracts leaf-like. Perianth 2-whorled or sometimes lacking a corolla in female flowers; calyx with a short tube, 3- or 5(rarely 4)-lobed; lobes imbricate, petaloid, entire, persistent; petals 3 or 5(rarely 4), free, always shorter than calyx lobes, persistent. Glands 4 or 5, antipetalous. Male flowers with slender pedicels; stamens 3 or 5, antisepalous; filaments free; anthers 4-celled, dehiscing by terminal pores; rudimentary ovary present. Female flowers with mostly stout pedicels; ovary 3-locular, smooth, glabrous; locules biovulate; styles 3, free or shortly fused at base, each spreading, persistent, deeply 2-partite into linear branches or notched distally. Fruit capsular, depressed globose, 3- or 6-lobed, smooth or slightly rugose, glabrous, deshiscing septicidally into three 2-valved cocci leaving a persistent columella. Seeds wedge-shaped or reniform, white or light brown, smooth or variously sculptured, ecarunculate; endosperm copious.

A genus of fifteen species in tropical and temperate Australia and New Zealand. Fourteen species occur in Australia of which thirteen are endemic.

Key to Australian species of *Poranthera*

1. Leaves opposite **2**
Leaves alternate **7**

2. Plants dioecious, perennial with annual stems dying back to rootstock **3**
Plants monoecious, annual or rarely with perennial rootstock **4**

3. Flowers in short dense terminal racemes (N.S.W., Vic.) . . . . . **12. P. oreophila**
Flowers solitary in upper leaf axils (Tas.) . . . . . **13. P. petalifera**

4. Seeds smooth (W.A., S.A., Vic., N.S.W.) . . . . . **9. P. leiosperma**
Seeds tuberculate, granulate or striate **5**

5. Calyces mostly 3-lobed, or if 4- or 5-lobed then with 1 or 2 lobes much smaller than other 3; seeds granulate (W.A., N.T., S.A.) . . . . . **14. P. triandra**
Calyces 5-lobed, rarely 4-lobed; lobes all ± equal in dimensions; seeds tuberculate or striate **6**

6. Seeds granulate with translucent granules; stipules deeply dissected (W.A.) . . **3. P. dissecta**
Seeds tuberculate with white tubercules; stipules entire or slightly toothed distally (all States) . . . . . **10. P. microphylla**

7. Herbaceous perennials or erect woody annuals to 80(rarely to 150) cm high **8**
Small annuals to 30 cm high **12**

8. Seeds fenestrellate (W.A., S.A.) . . . . . **8. P. huegelii**
Seeds reticulate ridged, reticulate-foveate, granulate, verrucate or smooth **9**

9. Leaf laminae ≥ 2 cm long (Qld, N.S.W., Vic.) . . . . . **2. P. corymbosa**
Leaf laminae < 2 cm long **10**

10. Stipules laciniate (N.S.W.) . . . . . **5. P. ericifolia**
Stipules entire **11**

11. Leaf laminae narrow-obovate, 10–15 mm long, 1.5–3 mm wide (Qld, N.S.W.) . . . **11. P. obovata**
Leaf laminae linear, 4–10 mm long, 0.5–1.4 mm wide (W.A.) . . . . . **6. P. ericoides**

12. Seeds smooth or alveolate **13**
Seeds tuberculate, granulate or striate **16**

13. Seeds smooth (W.A., S.A., Vic., N.S.W.) . . . . . **9. P. leiosperma**
Seeds alveolate **14**

14. Flowers in terminal racemes; calyx lobes of male flowers ≤ 1 mm long (W.A., N.T.) . . . . . **1. P. coerulea**
Flowers in umbel-like racemes arranged in loose corymbose panicles; calyx lobes of male flowers 1.1–1.5 mm long **15**

15. Leaf laminae narrow-oblanceolate, cuneate at base (W.A.) . . . . . **4. P. drummondii**
Leaf laminae spathulate, attenuate at base (W.A.) . . . . . **7. P. florosa**

16. Stipules deeply lobed (W.A.) . . . . . **3. P. dissecta**
Stipules entire **17**

17. Calyces 3-lobed, rarely 4- or 5-lobed; leaves 2–5.5 mm long; seeds granulate (W.A., N.T., S.A.) . . . . . **14. P. triandra**
Calyces 5-lobed; leaves 6–11 mm long; seeds tuberculate (all States) . . . . **10. P. microphylla**

---

1. Poranthera coerulea O.Schwarz, *Repert. Spec.Nov.Regni Veg.* 24: 87 (1927). **Type:** Northern Territory. 8 miles (c. 13 km) E of Port Darwin, N.T., *s.d.*, [*F.A.K.*] *Bleeser 237*; holo: B (destroyed); Thorak's Reserve, *c.* 10 miles (*c.* 16 km) SE [of] Darwin, 21 March 1961, *G. Chippendale 7856* (neo [here chosen]: DNA; isoneo: BRI, NSW).

***Illustration*:** Dunlop *et al.* (1995: 235, fig. 77), as *Poranthera microphylla.*

Monoecious, diffuse to compact annuals to 8 cm high. Stems unbranched or much branched distally; branchlets erect, smooth, glabrous, 1–1.5 mm across, with leaf scars obscure. Leaves subsessile, alternate, widely spaced along branchlets; stipules white, narrow-triangular, 1.5–2 mm long, entire or erose; laminae narrow-obovate to obovate, 13–27 mm long, 3–8 mm wide, flat, smooth and glabrous adaxially and abaxially, discolorous; midrib impressed proximally adaxially, prominent abaxially; base attenuate; apex obtuse to acute. Flowers in short

dense terminal racemes; racemes solitary or rarely several in a leafy terminal corymb; peduncles up to 6 mm long; rachis up to 20 mm long; bracts narrow-obovate, 2–5 mm long, 0.7–1 mm wide, acute. Male flowers with pedicels 0.8–1.3 mm long; calyx lobes 5, white or pink, obovate, 0.6–0.9 mm long, 0.4–0.5 mm wide, concavo-convex, rounded at apex; petals 5, white, erect, incurved distally, oblanceolate, 0.3–0.4 mm long, up to 0.1 mm wide, obtuse, with margins entire; glands ovate, up to 0.1 mm wide; stamens 5; filaments 0.7–0.8 mm long, slightly incurved; anthers *c.* 0.1 mm long; rudimentary ovary 3-lobed; lobes clavate, *c.* 0.4 mm long. Female flowers with pedicels 0.6–1 mm long, extending to *c.* 5 mm long in fruit; calyx lobes 5, white or pale pink, oblong, 1.1–1.3 mm long, 0.5–0.6 mm wide, ± flat, obtuse at apex; petals 5, white, linear-oblong, *c.* 0.3 mm long, *c.* 0.1 mm wide, obtuse, with margins entire; ovary depressed globose, 1.5–1.9 mm across, deeply 6-lobed, emarginate distally, ± smooth; styles each 0.5–0.7 mm long, deeply 2-partite, slender. Capsules depressed globose, 1.9–2.1 mm across, 0.9–1.1 mm long, shallowly 3 lobed, emarginate and slightly rugose distally. Seeds reniform, 0.6–0.7 mm long, 0.4–0.5 mm wide, 0.5–0.6 mm across; testa alveolate, brown.

***Additional specimens examined*: Western Australia.** Mt Elizabeth track to Munja, Jul 1996, *Kenneally 11815* (PERTH). **Northern Territory.** *c.* 40 km NW of Jabiru, Mar 1981, *Craven 7691 & Whitbread* (CANB, MEL); Kapalga, Kakadu NP, Mar 1994, *Egan 3306* (BRI); Port Darwin, *s.d.*, *Holtze 537* (MEL); Melville Island, Apr 1986, *Johnson 4103* (BRI); Yirrkala, Sep 1948, *Specht 1020* (BRI); 4 km ESE of Jabiru, E of Ranger Plant, Apr 1980, *Telford 7535 & Wrigley* (CANB).

***Distribution and habitat*:** *Poranthera coerulea* has a disjunct distribution. It occurs from the Darwin area east to Yirrkala, Northern Territory, with one isolated population in the Kimberley region, Western Australia. It is recorded as growing in open forest or woodland communities sometimes with a grassy understorey. The soils are sandy with ironstone gravel or lateritic red earths, in damp areas on plains or along damp creek beds. **Map 1**.

***Phenology*:** Flowers and fruits have been collected in March, April, July and September.

***Affinities*:** *Poranthera coerulea* is easily distinguished from *P. microphylla*, with which it has been confused, by having a generally more robust habit, an alveolate seed coat and generally longer and broader leaves.

***Typification*:** No type material of the name *Poranthera coerulea* has been located by us. Schwarz (1927) published the name *P. coerulea* based on a specimen at B collected in the Darwin area by F.A.K. Blesser labelled "Port Darwin, 8 miles E (Bleeser no. 237)". This type is believed to have been destroyed during the Second World War (McKee 1963). According to Orchard (1999), Bleeser also sent specimens from the Northern Territory to K, MEL and NSW. No duplicates of the above Bleeser collection have been located in material of *Poranthera* on loan from K, and searches in MEL and NSW (by the first author) have also been unsuccessful. The collection *Chippendale 7856* (DNA) from approximately 16 km south east of Darwin is therefore chosen here as neotype of *P. coerulea* O.Schwarz. This collection agrees with the protologue description except that its leaves are slightly shorter in length than what Schwarz recorded for the species.

2. Poranthera corymbosa Brongn., *Ann. Sci. Nat. (Paris)* 29: 385 (1833); *Poranthera corymbosa* Brongn. var. *corymbosa*, Müll. Arg. in A.DC., *Prodr.* 15(2): 192(1866); *Poranthera corymbosa* var. *genuina* Müll.Arg. in A.DC., *Prodr.* 15(2): 192 (1866), *nom. inval.*; *Poranthera corymbosa* var. *linarioides* Grüning in A. Engler, *Pflanzenr.* Heft 58: 19 (1913), *nom. inval; Poranthera linearoides* Baill., *Étude Euphorb.* 574, *Atlas* 45/6, t. 25, figs. 1-9 (1858), *nom. illeg.* **Type:** [Australia.] Port Jackson, *s.d.*, [*C.*] *Gaudichaud 112* (lecto [here chosen]: P 152752).

Poranthera arbuscula Sond., *Linnaea* 28: 567 (1856); *Poranthera corymbosa* var. *arbuscula* (Sond.) Müll.Arg. in A. DC., *Prodr.* 15(2): 192 (1866). **Type:** [New South Wales.] Fl. Novae Holl, *s.d.*, *Sieber 116* (lecto [here chosen]: MEL2062902 (ex herb. Sonder); isolecto: MEL2062901; 2065789).

? *Poranthera corymbosa* var. *sparsifolia* Grüning in A. Engler, *Pflanzenr.* Heft 58: 19 (1913). **Type citation:** "Neusudwales;

Parramatta (F. Mueller!). Queensland: Sandy Island (ohne Sammlernamen!)." (syntypes: *n.v.*).

***Illustrations*:** Grüning (1913: 17, fig. 4A-E), as *Poranthera corymbosa* var. *arbuscula*; James & Harden (1990: 394); Jeanes (1999: 73, fig. 11c).

Monoecious, erect annuals or herbaceous perennials to 80 (rarely to150) cm high. Stems sparingly branched; branchlets erect, smooth, glabrous, up to 6 mm across, with leaf scars prominent. Leaves sessile, alternate, crowded; stipules white, narrow-triangular, 2.3–3.8 mm long, entire; laminae linear or narrow-oblanceolate, (15–)20–90 mm long, 0.3–6 mm wide, flat with margins recurved to revolute, smooth and glabrous adaxially and abaxially, discolorous; midrib impressed proximally adaxially, prominent abaxially; base attenuate or cuneate; apex acute to obtuse. Flowers in short dense terminal umbel-like racemes; racemes in a lax leafy terminal corymb; peduncles up to 100 mm long; rachis 3–5 mm long; bracts narrow-obovate, 1.5–5 mm long, 0.3–1.3 mm wide, obtuse. Male flowers with pedicels 1–2.7 mm long; calyx lobes 5, white, obovate, 1.5–2.7 mm long, 0.7–1 mm wide, ± flat, rounded at apex; petals 5, white, erect, linear to oblanceolate, 0.7–0.9 mm long, 0.1–0.2 mm wide, acute, with margins entire; glands 2-lobed, 0.2–0.4 mm wide; stamens 5; filaments 1.3–1.8 mm long, slightly incurved; anthers 0.2–0.3 mm long; rudimentary ovary 3-lobed; lobes clavate, 0.5–0.8 mm long. Female flowers with pedicels 0.8–2.5 mm long, extending to *c.* 5 mm in fruit; calyx lobes 5, white, obovate, 1.6–2.2 mm long, 0.8–1.3 mm wide, slightly concavo-convex, rounded at apex; petals 5, white, oblong, 0.5–0.8 mm long, 0.1–0.3 mm wide, obtuse, with margins entire; ovary depressed globose, 1.1–1.6 mm across, shallowly 6-lobed, slightly emarginate distally, smooth; styles each 0.9–1.5 mm long, deeply 2-partite, slender. Capsules depressed globose, 2.8–3.1 mm across, 1.6–2 mm long, shallowly 3-lobed, emarginate distally, ± smooth. Seeds wedge-shaped, 1.1–1.3 mm long, 0.8–0.9 mm wide, 0.8–0.9 mm across; testa reticulate, white.

***Selected specimens* (*from 140 examined*): Queensland.** Darling Downs District: Mt Janet Road, Passchendaele State Forest, Oct 1997, *Bean 12478* (BRI); 15.7 km SW of Stanthorpe, portion 87, Stalling Lane, Nov 1994, *Halford Q2321* (BRI). Moreton District: Mount Ernest, McPherson Range, Sep 1990, *Forster PIF7397 et al.* (BRI, CANB, MEL, NSW); Stags Head, E ridge 2 km E of Mt Clunie, 32 km WSW of Rathdowney, Sep 1997, *Halford Q3546* (BRI). **New South Wales.** Carters Creek crossing, *c.* 16 km NNW of Nelligen, Feb 1980, *Adams 3450 & Gray* (CANB, NSW); 3 km SW of the Old Hut Creek crossing of Nethercote Road, Nullica State Forest, Oct 1985, *Albrecht 2050* (MEL, NSW); Blackheath Glen, Blue Mountains, Nov 1969, *Burgess s.n.* (CANB [CBG033397]); W side of Cox's Gap, E of Bylong, Oct 1979, *Chapman 1553* (BRI, CANB, MEL, NSW); 2.4 km along the Flagstone Creek track from the Gulf Road, *c.* 19 km (direct) just W of N of Emmaville, Oct 1990, *Coveny 14619 et al.* (BRI, CANB, NSW); Wombeyan Caves along the road to Mittagong, Oct 1988, *Greuter 21387* (NSW); Edinburgh Castle, 8 km SSE of Woodenbong, Dec 1992, *Halford Q1554A* (BRI, NSW); *c.* 18 km NW of Sandy Hollow heading towards Merriwa, Sep 1990, *Henderson & Turpin H3413* (BRI); Torrington, New England, Sep 1969, *Jones 4068* (CANB); Turpentine Range, *c.* 10 miles (*c.* 16 km) W of Tomerong, Sep 1965, *McGillivray 1485* (NSW); *c.* 13 km W of Tomerong in the Sassafras Range, between Braidwood and Nowra, Nov 1968, *Pullen 4333* (CANB, NSW); Craters Creek, Currowan State Forest, WNW of Batemans Bay, Dec 1973, *Pullen & Story 8732* (BRI, CANB, NSW); 17 km E of Tianjara Falls along Turpentine Road, Aug 1984, *Stewart 96 et al.* (CANB, MEL). **Victoria.** Brisbane Ranges NP, Mt Wallace - Bacchus Marsh Road junction of Aeroplane Road, Oct 1977, *Beauglehole ACB56761 & Errey* (MEL); Pyrete Ranges, Oct 1982, *Kemp s.n.* (MEL 628611); Hard to Seed Track, 9.5 km SW of Genoa Peak, Oct 1983, *Walsh 1226* (MEL).

***Distribution and habitat*:** *Poranthera corymbosa* occurs in south-eastern Australia from near Stanthorpe and the McPherson Range, in south-eastern Queensland, through New South Wales to East Gippsland, Victoria, with disjunct records from the Grampian, Pyrete and Brisbane Ranges, in western Victoria. It is recorded growing in heath, open eucalypt woodland or forest communities in mostly well-drained sandy soils overlying a variety of substrates. **Map 2**.

***Phenology*:** Flowers have been collected throughout the year, but mainly from September to November, fruits from September to January.

***Typification*:** In his protologue of *P. corymbosa,* Brongniart cited two collections, namely "ad Port-Jackson in Nova-Hollandia (*Gaudichaud* et *d'Urville* in herb. Mus. Par.)". These Gaudichaud and Dumont d'Urville collections

have been located at P (numbered 152752 and 152751 respectively). The Gaudichaud specimen is selected here as lectotype of *Poranthera corymbosa* Brongn. as it is part of the original material, agrees with the protologue and is more than likely the material illustrated in the protologue.

In his protologue of *P. arbuscula,* Sonder cited two collections, namely "Nov. Holland. austral. (Dr F. Mueller)" and "Sieber Herb. Nov. Holl. no. 116 ex parte". In MEL, there are three sheets of Sieber's collection, numbered 2062901, 2065789 and 2062902, and one specimen labelled "P. arbuscula, P. cicabricosa, Nov. Holla. Austr. Ferd. Mueller", numbered 2062936. They are all from Sonder's herbarium. There is also a specimen in MEL numbered 694305 which is labelled "Poranthera cicabricosa f mueller (1847) Encounter Bay [SA]" which matches the Mueller collection in the Sonder herbarium. We believe it to be a duplicate of that specimen. The Mueller and Sieber collections Sonder cited actually comprise two distinct taxa. The Sieber collection is conspecific with *P. corymbosa*, while the Mueller collection is undoubtedly conspecific with *P. huegelii* as circumscribed here. The Sieber specimen numbered 2062902 is selected here as lectotype of *P. arbuscula* Sond. as it is part of the original material, agrees with the protologue and is possibly annotated *P. arbuscula* by Sonder himself.

***Notes*:** The plant Grüning named *P. corymbosa* var. *sparsifolia* is probably conspecific with *P. corymbosa* as treated here but we have been unable to examine the syntypes to verify this. However, from Grüning's description it is reasonable to assume the two taxa are conspecific and not worthy of formal recognition. The supposed locality of collection of the syntype "Queensland, Sandy Island" is somewhat unusual for *P. corymbosa* as no other collections of this species we know of have been made on any of the coastal islands of Queensland. However, the locality of collection given for the other syntype, "Parramatta, F. Mueller", is within the presently known geographical range of *P. corymbosa.*

Poranthera corymbosa is somewhat variable in leaf size and plant stature. However, there seems no justification for recognising varieties within this species. Some small forms can be confused with *P. ericifolia* but can be distinguished from that by having entire stipules and generally more open, lax inflorescences.

3. Poranthera dissecta Halford & R.J.F.Hend., **sp. nov.** quoad habitu *P. triandrae* J.M.Black similis autem foliis anguste ovatis vel oblongis, stipulis profunde dissectis, floribus calycibus 5-lobis, pagina seminum minute striata differt. Olim collectiones *P. dissectae* ad *P. microphyllam* Brongn. relatae fuerunt sed *P. dissecta* a *P. microphylla* stipulis profunde dissectis, floribus capsulisque minoribus et pagina seminum striata differt. **Typus:** Western Australia. 22 km ESE of Lake King, 8 Aug 1968, *P.G. Wilson 6892* (holo: PERTH).

Monoecious, prostrate annuals. Stems much branched; branchlets smooth, glabrous, up to 0.5 mm across, with leaf scars obscure. Leaves sessile, opposite or alternate, widely spaced along branchlets; stipules white, narrow-triangular, 0.8–1.1 mm long, deeply 2–4-lobed; laminae narrow-obovate or elliptic, 2–3.6 mm long, 0.9–1.5 mm wide, flat, smooth and glabrous adaxially and abaxially, concolorous; midrib obscure adaxially, slightly raised proximally abaxially; base attenuate; apex obtuse to rounded. Flowers in short dense terminal umbel-like racemes; racemes solitary; rachis *c.* 1 mm long; bracts narrow-obovate, 0.9–1.5 mm long, 0.2–0.4 mm wide, obtuse to rounded. Male flowers with pedicels 0.5–1.1 mm long; calyx lobes 5 (or sometimes 4), colour when living unknown, narrow-obovate or oblong, 0.4–0.5 mm long, 0.1–0.2 mm wide, concave-convex, acute to obtuse at apex; petals 5, colour when living unknown, erect, ovate, *c.* 0.1 mm long, up to 0.05 mm wide, acute, with margins toothed distally; glands obscure; stamens 3, filaments up to 0.2 mm long, straight; anthers up to 0.1 mm long; rudimentary ovary a minute, hemispherical dome. Female flowers with pedicels 0.3–0.6 mm long, extending to 1.5 mm long in fruit; calyx lobes 5, colour when living unknown, narrow-ovate or oblong, 0.5–0.6 mm long, 0.1–0.2 mm wide, concavo-convex, acute at apex; petals obscure or absent; ovary depressed globose, 0.4–0.6 mm across, deeply

6-lobed, emarginate distally, papillose; styles each 0.1–0.4 mm long, shortly divided distally, slender. Capsules depressed globose, 1–1.3 mm across, 0.6–0.7 mm long, prominently 6-lobed, emarginate distally, rugose. Seeds wedge-shaped, *c.* 0.4 mm long, *c.* 0.3 mm wide, to *c.* 0.3 mm across; testa striate with translucent ridges. **Fig. 1**.

***Additional specimens examined*: Western Australia.** *c.* 45 km N of Stokes Inlet, Oct 1968, *Eichler 20286* (CANB); Victoria Desert, camp 53, Sep 1891, *Helms s.n.* (NSW455348); Karolin [Karlgarin], Sep 1891, *Helms s.n.* (MEL2065544); Mt Andrew, *c.* 120 km SE of Norseman, Sep 1980, *Newbey 7595* (PERTH).

***Distribution and habitat*:** *Poranthera dissecta* occurs in scattered populations in southern Western Australia, in an area more or less bounded by Norseman, Ravensthorpe and Karlgarin. It is recorded as growing in well-drained granitic loamy sand near granite outcrops. **Map 3**.

***Phenology*:** Flowers and fruits have been collected from August to October.

***Affinities*:** *Poranthera dissecta* resembles *P. triandra* in stature but differs from that by having narrow-ovate or oblong leaves, deeply dissected stipules, a 5-lobed calyx and a minutely striate seed surface. Collections of *P. dissecta* have been referred in the past to *P. microphylla*. *Poranthera dissecta* differs from *P. microphylla* by its deeply dissected stipules, smaller flowers and capsules and its striate seed surface.

***Etymology*:** The specific epithet is derived from Latin, *dissectus*, dissected, in reference to the species' deeply dissected stipules.

4. Poranthera drummondii Klotzsch in J.G.C. Lehmann, *Pl. Preiss.* 2: 231 (1848); *Poranthera microphylla* var. *drummondii* (Klotzsch) Müll.Arg. in A.DC., *Prodr.* 15(2): 193 (1866). **Type:** [Western Australia.] In sands of the Swan River, in 1839, *J. Drummond s.n.* (syn: *n.v*); [Western Australia.] Rotenest (Rottnest Island), 21 Aug 1839, *L. Preiss 2048* (syn: LD 99/018-0884; isosyn: B (ex herb. L.C. Treviranus), G-DC *n.v.* (IDC microfiche 800-73 2453: II.4); MEL 2062911, 2062926 (ex herb. Sonder)).

Monoecious, compact annuals to 15 cm high. Stems sparingly or much branched; branchlets erect or ascending, ± smooth, glabrous, up to 1.1 mm across, with leaf scars obscure. Leaves sessile, alternate, widely spaced along branchlets; stipules white, narrow-triangular, 1.3–2.5 mm long, entire or erose; laminae narrow-oblanceolate, 9-31 mm long, 1.4–3.5 mm wide, flat with margins slightly recurved, smooth and glabrous adaxially and abaxially, discolorous; midrib obscure adaxially, prominent or slightly raised proximally abaxially; base cuneate; apex rounded to obtuse. Flowers in short dense terminal umbel-like racemes; racemes solitary or several in a leafy terminal corymb; peduncles up to 25 mm long; rachis up to 3 mm long; bracts narrow-obovate, 2–6 mm long, 0.5–0.9 mm wide, obtuse to rounded. Male flowers with pedicels 0.8–2.2 mm long; calyx lobes 5, white, narrow-obovate, 1.4–1.5 mm long, 0.4–0.8 mm wide, ± flat, rounded at apex; petals 5, white, erect, narrow-ovate or oblanceolate, 0.1–0.8 mm long, up to 0.1 mm wide, acute, with margins entire; glands clavate, *c.* 0.1 mm wide; stamens 5; filaments 0.6–1 mm long, incurved; anthers *c.* 0.1 mm long; rudimentary ovary 3-lobed; lobes clavate, 0.2–0.6 mm long. Female flowers with pedicels 0.8–1.5 mm long, extending to 4.5 mm in fruit; calyx lobes 5, white, narrow-obovate to oblong, 1–1.5 mm long, 0.4–0.7 mm wide, ± concavo-convex, rounded at apex; petals 5, white, narrow-ovate, 0.2–0.6 mm long, 0.1–0.2 mm wide, acute, with margins entire or erose; ovary depressed globose, 0.9–1 mm across, shallowly to deeply 6-lobed, emarginate distally, papillose; styles each 0.5–0.8 mm long, 2-partite, slender. Capsules depressed globose, 1.7–1.9 mm across, 0.5–0.6 mm long, shallowly 6-lobed, emarginate distally, somewhat rugose. Seeds wedge-shaped, 0.6–0.7 mm long, 0.5–0.7 mm wide, 0.3–0.5 mm across; testa alveolate, grey-white.

***Selected specimens (from 30 examined)*: Western Australia.** Guildford, Perth, Nov 1901, *Andrews s.n.* (PERTH); Dillon Bay, Oct 1963, *Aplin 2749* (PERTH); Cape Naturaliste, Oct 1978, *Aplin 6444* (PERTH); Cape Leeuwin, S of Augusta, Sep 1965, *Beauglehole ACB12508* (NSW, PERTH); S end of Garden Island, Oct 1978, *Cranfield 28* (PERTH); *c.* 3 km S of homestead, Dirk Hartog Island, Sep 1972, *George 11348* (PERTH); S outskirts of Kalbarri township, near Telecom tower, Sep 1988, *Henderson H3148A* (BRI); *c.* 10 km SW of Lake Indoon on Leeman Road, Sep 1977, *Hnatiuk 770965* (PERTH); Bremer Bay, Sep 1974, *Newbey 4385* (PERTH); Hamelin Bay, Oct 1953,

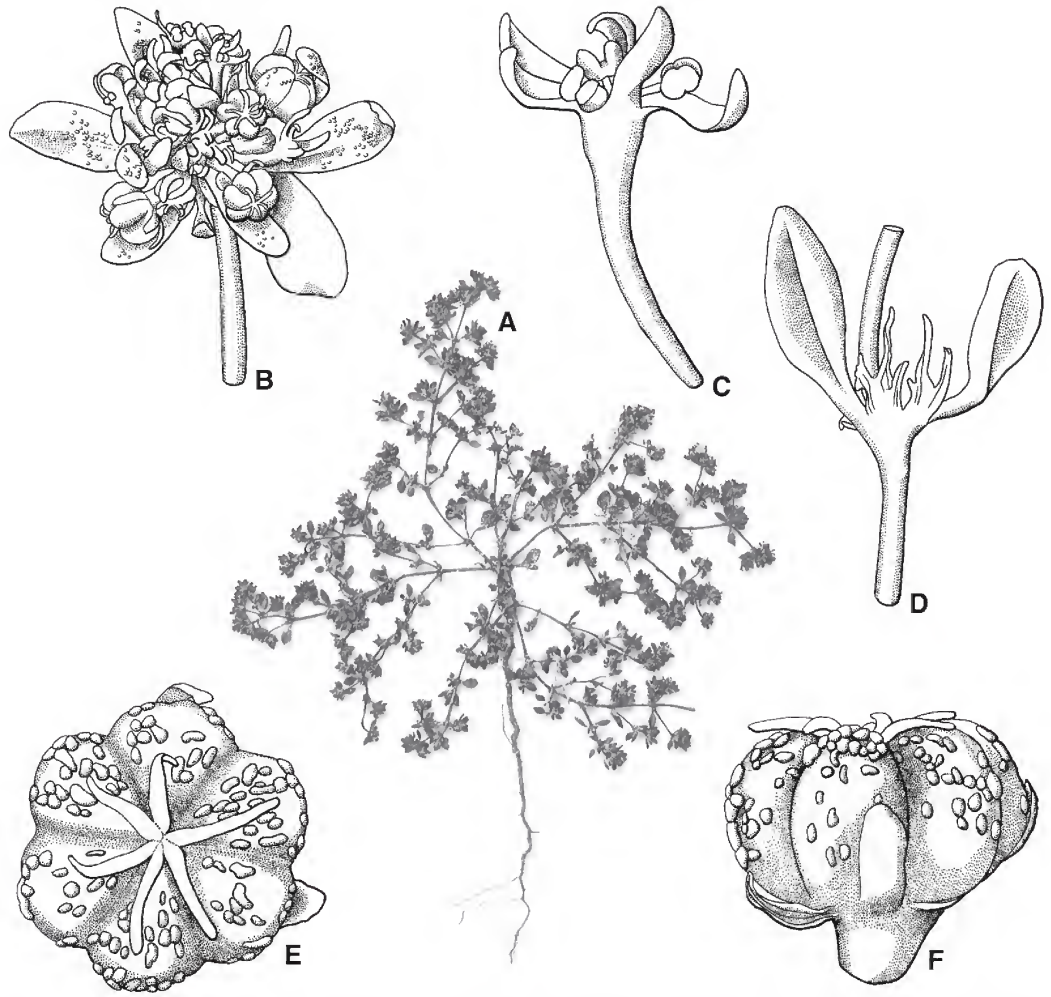


Fig. 1. ***Poranthera dissecta***. A. whole plant ×1. B. inflorescence ×8. C. male flower ×32. D. branchlet with leaf and stipules ×12. E. fruit from above ×32. F. fruit from side ×32. A from *Wilson 6892* (PERTH); B-F from *Eichler 20286* (CANB). Del. W. Smith.

Royce 4644 (PERTH); Nambung NP, Cervantes, Oct 1971, *Royce 9780* (PERTH); Yanchep NP, Nov 1965, *Scrymgeour 160* (PERTH); Helena Valley, Sep 1977, *Seabrook 257* (PERTH); Champion Bay, 1889, *Sewell s.n.* (MEL2065488); *c.* 10.7 km from Coorow, along road to Marchagee, Oct 1983, *Short 2202* (MEL); Rottnest Island, Aug 1956, *Storr 172* (PERTH); by scenic drive just NE of Cape Leeuwin, Nov 1982, *Strid 21403* (PERTH).

Distribution and habitat: *Poranthera drummondii* is confined to the coastal and subcoastal districts of south-west Western Australia, from Dirt Hartog Island southward to Augusta and eastward to Dillon Bay near Albany. It is recorded as growing in heathland, shrubland or open woodland communities in mostly sandy soils. **Map 4**.

Phenology: Flowers have been collected from August to November, fruits from September to November.

Affinities: Müller (1866) reduced this species to a variety of *P. microphylla*, while Bentham (1873) included it in *P. microphylla* without giving it formal recognition. Although *P. drummondii* is somewhat similar to the Western Australian populations of *P. microphylla*, it can easily be distinguished from that by its larger flowers and alveolate seed surface.

***Notes*:** The collection *Henderson H3148B* (BRI) has seeds that are more or less reniform with a faintly reticulate surface. This gathering was part of the collection *Henderson H3148A* (BRI) which is typical of *P. drummondii* with wedge-shaped seeds and an alveolate seed surface. More collections and further research are required to determine if this specimen represents a form requiring formal recognition.

5. Poranthera ericifolia Rudge, *Trans. Linn. Soc. London* 10: 301-303 (1811). **Type:** [New South Wales.] Port Jackson, *s.d.*, [without collector] (holo: BM *n.v.* (transparency at BRI)).

***Illustration*:** James & Harden (1990: 394).

Monoecious, erect, herbaceous perennials 10–30 cm high. Stems sparingly to much branched from base; branchlets erect, smooth or papillose, glabrous, 2–3 mm across, with leaf scars prominent. Leaves sessile, alternate, crowded; stipules white, narrow-triangular, 1.4–2 mm long, laciniate; laminae linear or narrow-oblanceolate, 8–15 mm long, 0.6–2 mm wide, flat to rounded with margins recurved to revolute, smooth and glabrous adaxially and abaxially, discolorous; midrib impressed proximally adaxially, prominent abaxially; base attenuate or cuneate; apex obtuse to subacute. Flowers in a short dense terminal umbel-like racemes; racemes in a compact leafy terminal corymb; peduncles 10-20 mm long; rachis 2–5 mm long; bracts narrow-obovate, 2–4 mm long, 0.5–0.9 mm wide, obtuse. Male flowers with pedicels 1.5–2 mm long; calyx lobes 5, pink or white, obovate, 1.7–2.2 mm long, 0.8–1 mm wide, ± concavo-convex, rounded at apex; petals 5, white, erect, recurved distally, linear to oblanceolate, 0.9–1.1 mm long, 0.2–0.3 mm wide, acute or obtuse, with margins entire; glands 2-lobed, 0.2–0.4 mm wide; stamens 5; filaments 1.8–2 mm long, slightly incurved; anthers 0.1–0.2 mm long; rudimentary ovary 3-lobed; lobes clavate, 0.7–1 mm long. Female flowers with pedicels 0.9–2.2 mm long, extending to *c.* 3 mm long in fruit; calyx lobes 5, white or pink, oblong, 1.5–2 mm long, 0.6–0.8 mm wide, ± concavo-convex, rounded at apex; petals 5, white, linear-oblong, 0.5–0.9 mm long, 0.1–0.2 mm wide, acute, with margins entire; ovary depressed globose, 1–1.5 mm across, deeply 6-lobed, emarginate distally, smooth; styles each 0.9–1.4 mm long, deeply 2-partite, slender. Capsules depressed globose, 2.4–2.9 mm across, 1.4–1.6 mm long, shallowly 6-lobed, emarginate distally, papillose. Seeds wedge-shaped, 0.9–1.1 mm long, 0.7–0.9 mm wide, 0.8–0.9 mm across; testa reticulate, white.

***Selected specimens (from 60 examined)*: New South Wales.** Gospers Mountain, Apr 1983, *Benson & Keith 1416* (NSW); near Wyong, Oct 1948, *Burbidge 2869* (CANB); Wentworth Falls, King's Tableland, Nov 1962, *Burgess s.n.* (CANB [CBG001710]); Mt Manning (Bucketty), Sep 1963, *Burgess s.n.* (CANB [CBG001619]); Victoria Falls Road, Blue Mountains, Dec 1947, *Constable s.n.* (NSW); Belrose, Nov 1981, *Coveny 11055 & Hind* (NSW); Kioloa State Forest, Oct 1966, *Evans 2515* (NSW); near Sublime Point, Leura, Dec 1961, *Goode 528* (NSW); on road to Mt Hay, *c.* 4 km N of Leura, Blue Mountains NP, Oct 1990, *Henderson & Turpin H3419* (BRI); Comleroy Road near entrance to Wollemi NP, Oct 1987, *Hind 5393 et al.* (BRI, NSW); 1.8 km along Forest Road towards Currawong, Sep 1995, *Jobson 3785* (MEL); "Eagle Rock", N of Mogo Creek Road, 20 km S of Bucketty towards St Albans, Oct 1996, *Jobson 4422* (NSW); Mt Kindarun, 14 miles (*c.* 22 km) NNW of Putty, Sep 1959, *Johnson & Constable s.n.* (NSW); Walls lookout, Pierces Pass, near Mt Banks, Dec 1970, *Lassak s.n.* (NSW); Mt Victoria, Nov-Dec 1889, *Maiden s.n.* (NSW); "Big Hill", Mittagong, Dec 1960, *Mowle 47* (CANB); Tarougra Forest Road, 2 km E of Bodalla along Potato Point Road, Oct 1986, *Mullins 702* (CANB); northern Budawang Range, Camping Rock Creek, S of Sassafras, Oct 1971, *Pulley & Telford BR270* (CANB); 3 km N of Karuah on Pacific Hwy, Aug 1967, *Telford 211* (CANB); near old sawmill, 10 miles (*c.* 16 km) S of Sassafras, Oct 1965, *Whaite 2916* (NSW).

***Distribution and habitat*:** *Poranthera ericifolia* is confined to coastal and subcoastal areas of New South Wales, from Weston southwards to Nowra. It is recorded as growing in heathland, shrubland, and eucalypt woodland or open forest communities usually in sandy soils derived from sandstone. **Map 5**.

***Phenology*:** Flowers have been collected in April and from July to December, fruits in February, March and from September to December.

***Notes*:** *Poranthera ericifolia* has been confused with *P. corymbosa* but is easily distinguished from that by having laciniate stipules, smaller leaves and shorter and more compact habit.

6. Poranthera ericoides Klotzsch in J.G.C. Lehmann, *Pl. Preiss.* 2: 231 (1848); *Poranthera ericoides* Klotzsch var. *ericoides*, Domin, *Vestn. Kral. Ceske*

Spolecn. Nauk. Tr. Mat.-Prir. (*Mém. Soc. Roy. Sci. Bohême, Prague*) 1921/2(2): 58 (1923); *Poranthera ericoides* var. *typica* Domin, *Vestn. Kral. Ceske Spolecn. Nauk. Tr. Mat.-Prir. (Mém. Soc. Roy. Sci. Bohême, Prague)* 1921/2(2): 58 (1923), *nom. inval.* **Type:** [Western Australia.] Hay, 7 Nov 1840, *L. Preiss 2050* (holo: LD 99/018-0885; iso: MEL 2062927 (ex herb. Sonder)).

Poranthera piceoides Klotzsch in J.G.C. Lehmann, *Pl. Preiss.* 2: 232 (1848). **Type:** [Western Australia.] In sand in forest near Bull's Creek, Perth, Nov 1841, *L. Preiss* 2044 (syn: LD 99/018-0889; isosyn: G-DC *n.v.* (microfiche IDC 800-73. 2453: I.7); MEL 617990, 2062929 (ex herb. Sonder); [Western Australia.] In sand in the shade in forest near Pine-Aple [Pineapple inn, near Perth, *fide* Marchant 1990], 14 Sep 1830, *L. Preiss 1227* (syn: LD 99/018-0888; isosyn: G-DC *n.v.* (microfiche IDC 800-73. 2453: I.7 (top element)); MEL 2062908 (ex herb. Sonder), 1617991).

Monoecious, compact, herbaceous perennials to 15 cm high. Stems much branched at base; branchlets erect or procumbent, smooth or papillose, glabrous, 0.6–2.5 mm across, with leaf scars prominent. Leaves ± sessile, alternate, crowded on branchlets; stipules white, narrow-triangular, 0.6–1.1 mm long, entire; laminae linear, 4–10 mm long, 0.5–1.4 mm wide, rounded with margins recurved to midrib, smooth and glabrous adaxially and abaxially, concolorous; midrib obscure adaxially, prominent abaxially; base cuneate; apex obtuse. Flowers in short dense terminal umbel-like racemes; racemes solitary or several in a leafy compact terminal corymb; peduncles up to 15 mm long; rachis up to 4 mm long; bracts narrow-obovate, 2–3.5 mm long, 0.6–0.8 mm wide, acute to obtuse. Male flowers with pedicels 1–1.7 mm long; calyx lobes 5, white or sometimes with pinkish hue, oblong or obovate, 1.2–2 mm long, 0.5–0.8 mm wide, ± flat, rounded at apex; petals 5, white, erect, oblanceolate, 0.5–0.9 mm long, 0.2–0.4 mm wide, acute, obtuse to rounded, with margins entire; glands 2-lobed, 0.1–0.3 mm wide; stamens 5, filaments 1.3–2 mm long, slightly incurved; anthers *c.* 0.2 mm long; rudimentary ovary 3-lobed; lobes clavate, 0.6–0.8 mm long. Female flowers with pedicels 0.5–1.5 mm long, extending to *c.* 5 mm long in fruit; calyx lobes 5, white sometimes with a pinkish hue, oblong, 1.3–1.8 mm long, 0.4–0.8 mm wide, ± flat, rounded at apex; petals 5, white, linear-oblanceolate, 0.7–0.8 mm long, 0.3–0.4 mm wide, acute to obtuse, with margins entire; ovary globose, 1–1.7 mm across, shallowly to deeply 6-lobed, emarginate distally, smooth or papillose; styles each 1.1–1.5 mm long, deeply 2-partite, slender. Capsules depressed globose, 2–2.5 mm across, *c.* 1.5 mm long, prominently to shallowly 6-lobed, emarginate distally, rugose. Seeds wedge-shaped or rarely reniform, 1–1.2 mm long, 0.6–0.8 mm wide, 0.6–0.8 mm across; testa smooth and white or rarely verrucate and pale brown.

***Selected specimens* (*from 35 examined*): Western Australia.** Between Kukerin and Lake Grace, Nov 1931, *Blackall 1351* (PERTH); near Yanchep, 2 km from Wanneroo Road towards Gingin, Oct 1981, *Craven 6964* (MEL); Wanneroo, Nov 1976, *Demarz D6219* (PERTH); Gnangarra, Oct 1945, *Gardner s.n.* (PERTH); 18 miles (*c.* 29 km) E of Cranbrook, on Chester Pass Road, Nov 1959, *George 398* (PERTH); 3 miles (*c.* 5 km) N of Qualeup homestead, Nov 1960, *George 1780* (PERTH); Albany Hwy, N [of] Cranbrook turnoff, Nov 1961, *George 3097* (PERTH); near junction of Red Gum Pass road with Salt River Road, near NW boundary of Stirling Range NP, Sep 1988, *Henderson H3197* (BRI); 4.5 km W of Tarin Rock, Sep 1976, *Hnatiuk 761350* (PERTH); between Toll's Creek and Solomon's Well, Oct 1902, *Morrison s.n.* (PERTH); 1 mile (*c.* 1.6 km) E of Tambellup, Oct 1963, *Newbey 1155* (PERTH); 7 miles (*c.* 11 km) S of Wagin, Oct 1962, *Phillips s.n.* (CANB [CBG024913], NSW); near Gingin, and 15 miles (*c.* 24 km) from Muchea, Sep 1968, *Phillips 1855* (CANB, NSW); 5 km E of Tincurrin, Oct 1982, *Rechinger 59109* (PERTH); Moore River NP, Oct 1971, *Royce 9491* (PERTH); Talbot Brook, York, Sep 1921, *Sargent s.n.* (PERTH); 3 miles (*c.* 5 km) S of Gingin, Sep 1966, *Scrymgeour 1308* (PERTH); along No. 2 Rabbit Proof Fence, *c.* 40 km SSE of Jerramungup-Ravensthorpe road and *c.* 25 km N of Bremer Bay, Oct 1966, *Wilson 4353* (PERTH); 20 miles (*c.* 32 km) from Pingelly towards Wandering, on north road, Oct 1968, *Wrigley s.n.* (CANB [CBG027813]); 11 miles (*c.* 18 km) from Kukerin toward Lake Grace, Nov 1968, *Wrigley WA/68 5732* (CANB).

***Distribution and habitat*:** *Poranthera ericoides* is confined to south-western Western Australia from Winchester south east to near Ravensthorpe. It is recorded as growing in closed heath or mallee communities with a heath-like understorey in sand or sandy loam soils sometimes with gravel in the profile. **Map 6**.

***Phenology*:** Flowers have been collected from September to November, fruits in November.

***Affinities*:** *Poranthera ericoides* has been confused in the past with *P. huegelii*. *Poranthera ericoides* differs from that in the texture of its seed surface and in usually having a more compact habit.

***Notes*:** The inflorescence of *P. ericoides* is typically a more or less compact corymb, but there is a variant which has a more open and lax inflorescence somewhat resembling those in some forms of *P. huegelii*. This variation is particularly prevalent in material from the northern end of the range of *P. ericoides*, *e.g. Craven 6964* (MEL), *Phillips 1855* (CANB), *Royce 9491* (PERTH) and *Scrymgeour 1308* (PERTH).

There is a collection at PERTH (*Coleby-Williams 312*) from near Winchester which is *c.* 130 km north of the nearest other locality of collection of *P. ericoides* (in the Moore River National Park). This specimen is a plant which has a low compact habit typical of *P. ericoides* but its inflorescence is more corymbose than what is typical in *P. ericoides*. The collection *Newbey 4593* at PERTH, from near Chillicup Pool, is a plant with a more open spreading habit than that of the typical form of *P. ericoides*. More collections, especially of fruiting material, and further field investigations are required to determine if any of these forms are worthy of formal recognition.

7. Poranthera florosa Halford & R.J.F.Hend., **sp. nov.** maxime arcte affinis *P. drummondii* Klotzsch cum signis multis communiter autem foliis spathulatis folia angusta oblanceolata *P. drummondii* Klotzsch plerumque latioribus et insuper ab ea habitu leviter robustiore et inflorescentia plus florosa differt. **Typus:** Western Australia. Thumb Peak Range, 31 Oct 1965, *A.S. George 7134* (holo: PERTH; iso: PERTH).

Poranthera microphylla var. *intermedia* Müll.Arg. in A. DC., *Prodr.* 15(2): 193 (1866). **Type:** [Western Australia.] In moist hollows of rocks at eastern side of mountain, Melville, (Plantagenet), 5 Oct 1840, [*L.*] *Preiss 2045* (lecto, here chosen: LD99/018-0887 (specimen on left of sheet); isolecto: MEL 2062930, 2062930).

Monoecious, diffuse annuals to 20 cm high. Stems much branched from base; branchlets ascending to decumbent, smooth, glabrous, up to 2.5 mm across, with leaf scars obscure. Leaves sessile, alternate, widely spaced along branchlets; stipules white, narrow-triangular, 0.7–1.1 mm long, entire; laminae spathulate, 9–25 mm long, 2.5–5 mm wide, flat with margins slightly recurved, smooth and glabrous adaxially and abaxially, discolorous; midrib obscure adaxially, prominent abaxially; base attenuate; apex obtuse to rounded. Flowers in short dense terminal umbel-like racemes; racemes several in a leafy terminal corymb; peduncles up to 25 mm long; rachis up to 3 mm long; bracts narrow-obovate, 1.8–3 mm long, 0.4–0.8 mm wide, obtuse to rounded. Male flowers with pedicels 1.5–3.1 mm long; calyx lobes 5, white, obovate, 1.1–1.5 mm long, 0.5–0.7 mm wide, ± flat, rounded at apex; petals 5, white, erect, oblanceolate to narrow-obovate, 0.6–0.7 mm long, 0.1–0.3 mm wide, acute to obtuse, with margins entire; glands obdeltate, 0.2–0.3 mm wide; stamens 5; filaments 1.1–1.4 mm long, incurved; anthers *c.* 0.1 mm long; rudimentary ovary 3-lobed; lobes clavate, 0.5–0.6 mm long. Female flowers with pedicels 1.2–2.2 mm long, extending to 5.5 mm long in fruit; calyx lobes 5, white, oblong-obovate, 1.1–1.3 mm long, 0.4–0.7 mm wide, slightly concavo-convex, rounded at apex; petals 5, white, oblong, 0.3–0.4 mm long, 0.1–0.2 mm wide, acute, with margins entire; ovary depressed globose, 0.6–1 mm across, deeply 6-lobed, emarginate distally, papillose; styles each 0.5–1.1 mm long, deeply 2-partite, slender. Capsules depressed globose, 1.5–1.7 mm across, 0.9–1.1 mm long, shallowly 6-lobed, emarginate distally, rugose. Seeds wedge-shaped, 0.6–0.8 mm long, 0.4–0.5 mm wide, 0.4–0.5 mm across; testa alveolate, grey-white. **Fig. 2**.

***Selected specimens (from 10 examined)*: Western Australia.** Scott River, Dec 1957, *Churchill s.n.* (PERTH); Chespeck Road, Northcliffe, Dec 1983, *Cranfield 4880* (PERTH); Fitzgerald River, Sep 1948, *Gardner 9215* (PERTH); base of Talyuberup Peak, Stirling Range, Oct 1984, *Keighery 7278* (CANB, PERTH); W of Mt Magog, Stirling Range, Nov 1969, *Mann & George 146* (K, PERTH); Plantagenet, Nov 1901, *Pritzel 929* (PERTH); Bremer Bay, in 1900, *Wellstead s.n.* (PERTH).

***Distribution and habitat*:** *Poranthera florosa* is confined to south-western Western Australia from Scott River and Boggy Lake eastwards to the Stirling Range, Thumb Peak Range and Cape Arid. It is recorded as growing in heath, eucalypt mallee or woodland communities in stony sandy clay or clayey loam soils, or on the edge of granite outcrops. **Map 7**.

***Phenology*:** Flowers have been collected from September to December, fruits from October to December.

***Affinities*:** *Poranthera florosa* is most closely related to *P. drummondii* with which it shares many attributes. However, it differs from that by having spathulate leaves which are generally broader than the narrow-oblanceolate leaves of *P. drummondii*. *Poranthera florosa* also differs from that by its slightly more robust growth habit and more floriferous inflorescence.

***Typification*:** In his protologue of *P. microphylla* var. *intermedia*, Müller cited *Preiss no. 2045* at the Berlin Herbarium. The type material of *P. microphylla* var. *intermedia* has not been located at B, and it is believed to have been destroyed during World War II. Duplicates of *Preiss no. 2045* have been located at LD (one sheet) and MEL (two sheets). While the MEL sheets are all of one species, the sheet at LD contains material of two species. The smaller of the two specimens on that sheet, the fragment on the right, has flowers, fruit and seed and is referable to *P. microphylla* as circumscribed here. The specimen on the left of the sheet has flowers and is what we consider to be the species here named *P. florosa*. The Preiss duplicates at MEL match the specimen on the left of the LD sheet. Both specimens on the LD sheet would fit the brief description in the protologue of *P. micropylla* var. *intermedia*. To fix the application of the name then, the specimen on the left of this sheet is chosen here as lectotype of *P. microphylla* var. *intermedia*.

***Etymology*:** The specific epithet is derived from Latin, *florosus*, profusely flowering, and refers to the more floriferous inflorescences produced by this species in comparison with those of *P. drummondii*.

8. Poranthera huegelii Klotzsch in J.G.C. Lehmann, *Pl. Preiss*. 2: 231-232 (1848). **Type:** [Western Australia.] In subpeaty sandy soil between dense shrubs on plain near city of Albany (Plantagenet), Oct 1840. *Preiss. hb. 2047* (holo: LD 99/018-0886; iso: B (ex herb. L. C. Treviranus); G-DC *n.v.* (microfiche IDC 800-73. 2453: II.1); MEL1617992, 2062909 (ex herb. Sonder)).

***Illustration*:** Weber (1986: 763, fig. 407A), as *Poranthera ericoides*.

Monoecious, erect or rarely spreading, herbaceous perennials 30–60 cm high. Stems undivided or sparingly branched; branchlets erect or sometimes ascending, smooth, glabrous, up to 4 mm across, with leaf scars somewhat prominent. Leaves sessile, alternate, somewhat widely spaced along branchlets; stipules white, narrow-triangular, 1.1–3 mm long, entire or laciniate at the base; laminae linear, narrow-oblanceolate or narrow-elliptic, 9–26 mm long, 0.5–2.4 mm wide, flat to rounded with margins recurved, smooth and glabrous adaxially and abaxially, discolorous; midrib impressed proximally adaxially, prominent abaxially; base shortly cuneate; apex acute to obtuse sometimes terminated with a minute mucro. Flowers in short dense terminal umbel-like racemes; racemes in a lax leafy terminal corymb; peduncles up to 30 mm long; rachis up to 3 mm long; bracts narrow-obovate, 3–6 mm long, 0.5–1 mm wide, subacute to obtuse. Male flowers with pedicels 0.9–3 mm long; calyx lobes 5, white, obovate, 1.6–2.4 mm long, 0.6–0.9 mm wide, ± concavo-convex, rounded at apex; petals 5, white, erect, linear to oblanceolate, 0.6–1.6 mm long, 0.2–0.3 mm wide, acute to rounded, with margins entire; glands 2-lobed, 0.2–0.4 mm wide; stamens 5; filaments 1.7–2.7 mm long; anthers *c.* 0.2 mm long; rudimentary ovary 3-lobed; lobes clavate, 0.7–1.4 mm long. Female flowers with pedicels 0.3–1.7 mm long, extending to *c.* 4.5 mm in fruit; calyx lobes 5, white, oblong, 1.6–2.5 mm long, 0.5–1.1 mm wide, slightly concavo-convex, rounded at apex; petals 5, white, linear-oblong, 0.5–1.2 mm long, 0.3–0.4 mm wide, acute to obtuse, with margins entire; ovary subglobose, 1.1–1.6 mm across, shallowly 6-lobed, emarginate distally, smooth; styles each 1–1.7 mm long, deeply 2-partite, slender. Capsules depressed globose, *c.* 3 mm across, *c.* 2 mm long,

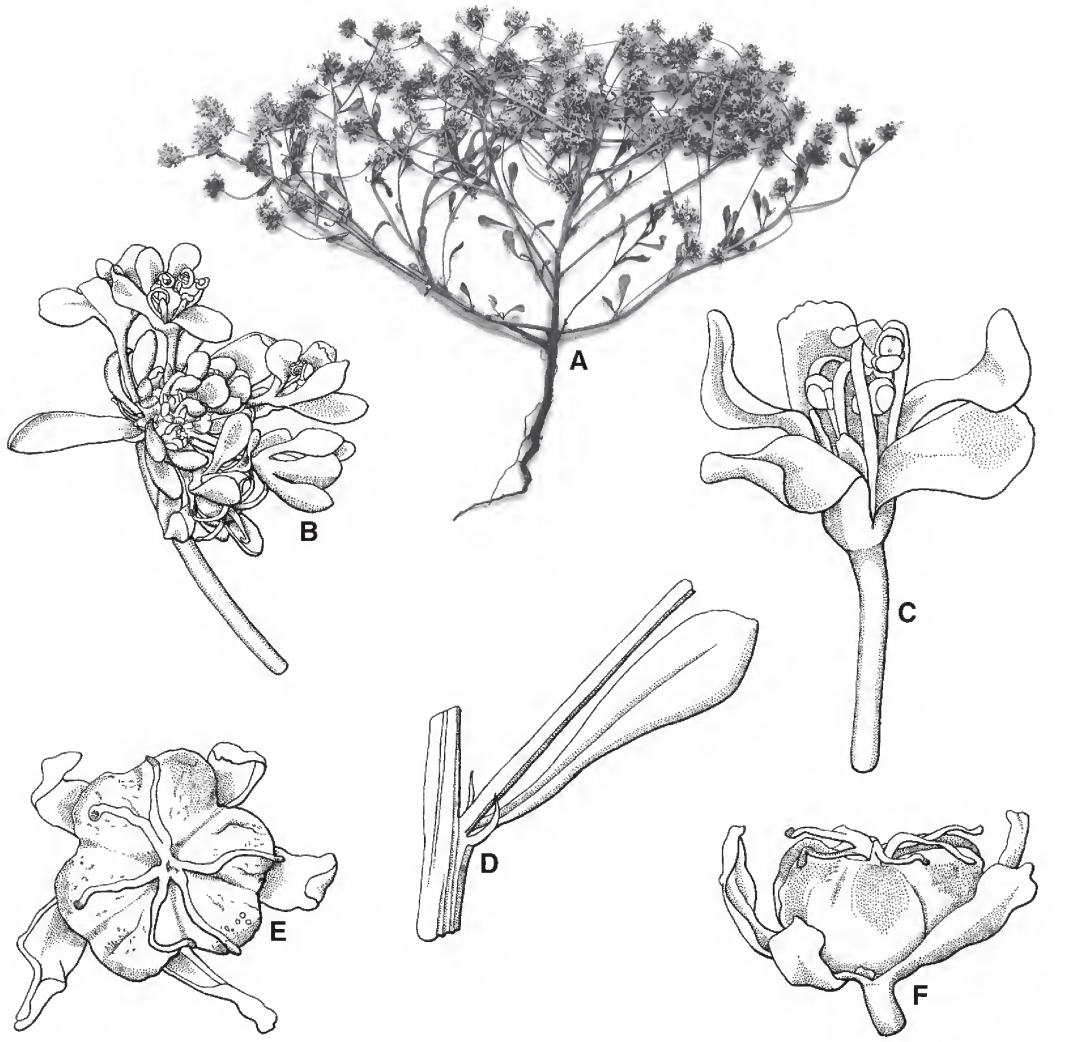


Fig. 2. ***Poranthera florosa.*** A. whole plant ×0.5. B. inflorescence ×8. C. male flower ×32. D. branchlet with leaf and stipules ×8. E. fruit from above ×16. F. fruit from side ×16. A-D from *George 7134* (PERTH); E, F from *Churchill s.n.* (PERTH). Del. W. Smith.

shallowly 3-lobed, emarginate distally, ± smooth. Seeds wedge-shaped, 0.8–1 mm long, 0.6–0.8 mm wide, 0.6–0.7 mm across; testa fenestrellate, translucent.

***Selected specimens (from 90 examined)*: Western Australia.** Jarrahdale, Oct 1908, *Andrews s.n.* (PERTH); 3 miles (*c.* 5 km) from Mt Barker towards Albany, Oct 1968, *Canning s.n.* (CANB [CBG038356]); 5 km S of Margaret River township on Caves Road, Oct 1983, *Corrick 8968* (MEL); E of Cape Naturaliste, near Castle Bay, Oct 1983, *Corrick 9005* (MEL); Mt Dale Road between main picnic area and corner of Ashendon Road, Darling Range, Oct 1984, *Corrick 9369* (CANB, MEL); Scarp Road, S of Serpentine Pipehead Dam, Nov 1984, *Corrick 9396* (MEL); Thumb Peak Range, Oct 1965, *George 7135* (PERTH); Gooseberry Hill, Oct 1897, *Helms s.n.* (PERTH); 7.2 km W of Point Malcolm Junction, Sep 1976, *Hnatiuk 761083* (PERTH); Washpool Road, 200 m E of Junction with Knights Road, 6 km S of intersection Woogenilup and Knights Road, Oct 1985, *Hoyle 1117* (CANB); Norman's Beach, North Point, 31 km due NE of Albany, Oct 1985, *Hoyle 1481* (CANB); Baby Barnett Hill, 30 km due NNE of Mt Barker township, Oct 1985, *Hoyle 1152* (CANB); 31 km S of Manjimup on South-West Hwy, Oct 1993, *Jobson 2513* (MEL); upper slopes of Mondurup Peak, Oct 1977, *Keighery 1195* (PERTH); 3 miles (*c.* 5 km) N of Mt Success, Oct 1962, *Newbey 594* (PERTH); 35 miles (*c.* 56 km) S of Perth on Albany Hwy, near Mt Cooke, Nov 1972, *Paust 1070*

(PERTH); summit of Mt Toolbrunup, Mar 1966, *Spratt 19* (PERTH). **South Australia.** Flinders Chase, Kangaroo Island, near Breakneck Creek, Nov 1973, *Nelson ANU17292* (CANB); Playford Hwy, near Roo Lagoon, Kangaroo Island, Nov 1989, *Overton 1140* (CANB); Ridge road near Yankalilla turn off, Fleurieu Peninsula, Dec 1967, *Symon 5501* (CANB); Flinders Chase, Kangaroo Island, Oct 1971, *Wace ANU13082* (CANB).

***Distribution and habitat*:** *Poranthera huegelii* has a disjunct distribution. It occurs in south-western Western Australia from New Norcia southwards to Augusta and eastwards to Israelite Bay, and in South Australia on Kangaroo Island and in the South Mount Lofty Ranges. It is recorded as growing in *Eucalyptus* woodland and open forest, and heath-mallee communities, often in sandy or gravelly lateritic soils. **Map 8**.

***Phenology*:** Flowers have been collected in March and from August to December, fruits in January, October and December.

***Affinities*:** *Poranthera huegelii* seems most closely related to *P. corymbosa* but is distinguishable from that and all other species of *Poranthera* by its fenestrellate seed coat.

***Notes*:** *Poranthera huegelii* shows variation in habit and the form of the inflorescence which relates somewhat to the geographical distribution of the species. Specimens from the western part of its range (from near New Norica southward to Augusta) have an erect, more or less unbranched habit with widely spaced leaves along the stem and a diffuse corymbose inflorescence. Specimens from the eastern part of its range (from Mt Barker eastward to Israelite Bay, Western Australia, and from Kangaroo Island and the South Mount Lofty Ranges in South Australia) tend to have a shorter and more branched habit, more crowded leaves and a more compact corymbose inflorescence. This eastern form has in the past been incorrectly identified as *P. ericoides* (*e.g.* by Weber 1986).

Specimens from the Stirling Range, Western Australia, (*e.g. Keighery 1195* (PERTH) and *Spratt 19* (PERTH)) tend to have an even shorter stature than those from the eastern part of the species' range. More collections and further investigations would be required to determine whether or not either of these forms warrants formal recognition.

9. Poranthera leiosperma Halford & R.J.F.Hend., **sp. nov.** maxime arcte affinis *P. microphyllae* Brongn. cum signis multis communiter autem pagina seminum laevi ad invicem tuberculata, foliis longioribus (11-15 mm longis vice 6-11 mm longis), stipulis longioribus (1.3-1.6 mm longis vice 0.8-1.3 mm longis) et insuper ab ea habitu leviter robustiore differt. **Typus:** Western Australia. 47 miles (*c.* 76 km) ENE of Laverton, 28 Sep 1966, *A.S. George 8098* (holo: PERTH).

Monoecious, spreading annuals to 10 cm high. Stems much branched at base; branchlets procumbent or erect, smooth, glabrous, 0.7–0.9 mm across, with leaf scars obscure. Leaves sessile, alternate or opposite, widely spaced along branchlets; stipules white, narrow-triangular, 1.3–1.6 mm long, entire; laminae narrow-obovate, 11–15 mm long, 2.1–4.1 mm wide, flat with margins slightly recurved, smooth and glabrous adaxially and abaxially, discolorous; midrib impressed proximally adaxially, slightly raised proximally abaxially; base attenuate; apex obtuse. Flowers in short dense terminal umbel-like racemes; racemes solitary; peduncles up to 13 mm long; rachis up to 4 mm long; bracts narrow-obovate, 4–5 mm long, 0.7–1 mm wide, apically rounded. Male flowers with pedicels 0.8–1 mm long; calyx lobes 5, white, obovate, 0.7–0.8 mm long, 0.4–0.5 mm wide, slightly concavo-convex, rounded at apex; petals 5, white, erect, oblanceolate, 0.2–0.3 mm long, *c.* 0.1 mm wide, acute, with margins entire; glands clavate, *c.* 0.1 mm wide; stamens 5; filaments 0.5–0.6 mm long, incurved; anthers *c.* 0.1 mm long; rudimentary ovary 3-lobed; lobes clavate, 0.2–0.3 mm long. Female flowers with pedicels 0.8–1 mm long, extending up to 7 mm long in fruit; calyx lobes 5, pink, oblong-elliptic, 0.7–0.8 mm long, 0.4–0.5 mm wide, slightly concavo-convex, rounded at apex; petals 5, white, linear-oblanceolate or narrow-obtrullate, *c.* 0.2 mm long, 0.1–0.2 mm wide, acute, with margins entire; ovary depressed globose, 0.8–1 mm across, shallowly 6-lobed, slightly emarginate distally, smooth; styles each 0.3–0.5 mm long, deeply 2-partite, slender. Capsules depressed globose, 1.6–1.8 mm across, 0.9–1 mm long, shallowly 3-lobed, emarginate distally, ± smooth. Seeds wedge-shaped, 0.7–1.2 mm long, 0.4–0.9 mm wide, 0.5–0.6 mm across; testa smooth, white. **Fig. 3**.

***Selected specimens (from 25 examined)*: Western Australia**. Entrance to Cape Le Grand NP, Nov 1979, *Cranfield s.n.* (PERTH); 10 km NW of Southern Cross on Bullfinch Road, Sep 1980, *Cranfield 1643* (PERTH); E of Laverton, Jul 1916, *Gardner 172* (PERTH); Victoria Desert, camp 53, Sep 1891, *Helms s.n.* (MEL2065543, NSW273990, NSW455349, NSW455351); 5.2 km W of Zanthus, Oct 1986, *Keighery & Alford 761* (PERTH); Parker's Range, in 1890, *Merrall s.n.* (MEL2065489); Comet Vale, Sep 1953, *Royce 4414* (PERTH); 8 miles (*c.* 13 km) S of Queen Victoria Spring, Oct 1956, *Royce 5531* (PERTH); 24 km E of Depot Springs Homestead, Aug 1970, *Wilson s.n.* (PERTH). **Northern Territory.** Kings Canyon, George Gill Range, Oct 1966, *Beauglehole ACB20404* (DNA, NSW); Reedy Creek Gorge, 4 miles (*c.* 6 km) E of Kings Canyon, George Gill Range, Oct 1966, *Beauglehole ACB20473A* (NSW). **South Australia.** *c.* 44.5 km direct N of Hypurna Homestead, Danggali Conservation Park, Sep 1980, *Conn 932* (AD); Great Australian Desert, 148 km N of Cook, Aug 1980, *Symon 12238* (CANB); *c.* 39.5 km direct N of Hypurna Homestead, Danggali Conservation Park, Sep 1980, *Toelken 6631 & Christensen* (AD). **New South Wales.** "Top Hut", NE of Mildura, Oct 1987, *Green s.n.* (NSW215901); 40 miles (64.4 km) N of Balranald, Oct 1970, *Mulham 396* (NSW); *c.* 1 mile (1.6 km) W of Timor Rock, near Coonabarabran, Jan 1962, *Salasoo 2253* (NSW). **Victoria.** Hattah Lakes NP, Sep 1969, *Anderson s.n.* (MEL694357); Kulkyne NP, Oct 1948, *Beauglehole ACB1035* (MEL).

***Distribution and habitat*:** *Poranthera leiosperma* is recorded from across southern Australia with scattered occurrences near Southern Cross, Western Australia, eastwards through southern Northern Territory, South Australia, north-western Victoria to near Coonabarabran in western New South Wales. It is recorded as growing in open shrubland and mallee communities frequently with *Triodia* spp. in the understorey in red sandy soils. **Map 9**.

***Phenology*:** Flowers and fruits have been collected in January and from July to November.

***Affinities*:** *Poranthera leiosperma* is most closely related to *P. microphylla* with which it shares many attributes. However, it differs from that by having seeds with a smooth rather than tuberculate surface, longer leaves (11–15 mm long as compared with 6–11 mm long) and longer stipules (1.3–1.6 mm long as compared with 0.8–1.3 mm long). *Poranthera leiosperma* also differs from *P. microphylla* in its slightly more robust growth habit.

***Etymology*:** The specific epithet is derived from Greek, *leio-*, smooth, and *spermus*, seed, and refers to the smooth seed coat in this species which contrasts with that in the majority of *Poranthera* species which is variously ornamented.

10. Poranthera microphylla Brongn., *Ann. Sci. Nat. (Paris)* 29: 385 (1833); *Poranthera microphylla* Brongn. var. *microphylla*, Müll.Arg. in A.DC., *Prodr.* 15(2): 193 (1866); *Poranthera microphylla* var. *genuina* Müll.Arg. in A.DC., *Prodr.* 15(2): 193 (1866), *nom. inval.* **Type:** [Australia.] Port Jackson, *s.d.*, [*L.A.*] *Lesson s.n.* (lecto, here chosen: P152754 (ex herb. Brongn.); isolecto: P152755).

Poranthera microphylla var. *diffusa* Müll.Arg. in A.DC., *Prodr.* 15(2): 193 (1866). **Type:** [Australia.] New Holland, *s.d.* [without collector] (holo: G-DC *n.v.* (microfiche IDC 800-73. 2453: II. 7)).

Poranthera microphylla var. *glauca* Müll.Arg. in A.DC., *Prodr.* 15(2): 193 (1866). **Type:** [Australia. New South Wales.] New Holland, in 1816, [without collector] (syn: G-DC *n.v.* (microfiche 800-73. 2453. II. 6); syn: B *n.v.* (? destroyed)).

Poranthera microphylla var. *diffusa* Ewart, *Fl. Victoria* 721 (1930), *nom. illeg.* **Type:** unknown; no material cited.

***Illustrations*:** Grüning (1913: 17, fig. 4F-G), as *Poranthera microphylla* var. *intermedia*; Cunningham *et al.* (1982: 464); James & . Harden (1990: 394); Wheeler (1992: 627, fig. 192A); Kenneally *et al.* (1996: 106); Kirkpatrick (1997: fig. 49f); Corrick & Fuhrer (2000: 82).

Monoecious, diffuse or compact annuals or rarely perennials, to 30 cm high. Stems much branched at base then sparingly branched distally; branchlets ascending to erect, ± smooth, glabrous, 1.5–2 mm across, with leaf scars obscure. Leaves sessile or shortly petiolate, alternate, subopposite or opposite, widely spaced along branchlets; stipules white, narrow-ovate, 0.8–1.3 mm long, entire; petioles where present up to 1.5 mm long; laminae narrow-oblanceolate to obovate, spathulate or ovate, 6–11 mm long, 1–4 mm wide, flat with margins slightly recurved, smooth and glabrous

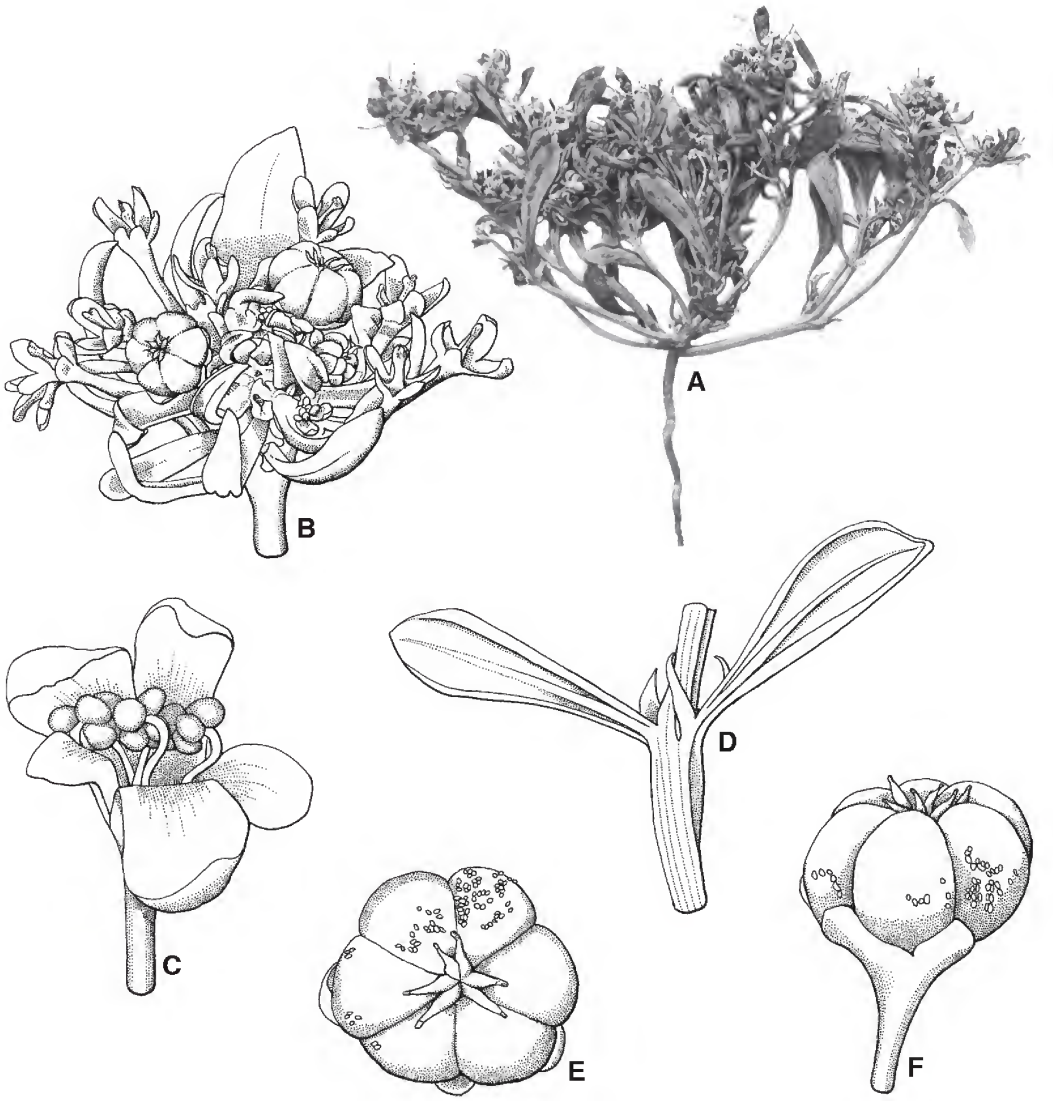


Fig. 3. ***Poranthera leiosperma***. A. whole plant ×1.5. B. inflorescence ×6. C. male flower ×32. D. branchlet with leaves and stipules ×6. E. fruit from above ×16. F. fruit from side ×16. A-F from *George 8098* (PERTH). Del. W. Smith.

adaxially and abaxially, discolorous; midrib obscure adaxially, prominent abaxially; base attenuate or cuneate; apex obtuse to rounded, usually shortly apiculate. Flowers in short dense terminal racemes; racemes solitary; peduncles up to 20 mm long; rachis up to 5 mm long; bracts narrow-obovate, 3–4 mm long, 0.5–0.7 mm wide, obtuse. Male flowers with pedicels 0.5–1.5 mm long; calyx lobes 5, white or pink, obovate or oblong, 0.4–1.5 mm long, 0.2–0.8 mm wide, ± concavo-convex, rounded or obtuse at apex; petals 5, mostly white, pink or sometimes pale mauve, erect, oblanceolate or linear, 0.2–0.6 mm long, 0.1–0.3 mm wide, obtuse, with margins erose; glands clavate or obdeltate, 0.1–0.4 mm wide; stamens 5; filaments 0.3–0.9 mm long; anthers up to 0.1 mm long; rudimentary ovary a hemispherical dome or 3-lobed; lobes clavate, 0.1–0.4 mm long. Female flowers with pedicels 0.2–1 mm long, extending to 9 mm long in fruit;

calyx lobes 5, white or pale pink with greenish band along midline, oblong-elliptic, 0.5–1.5 mm long, 0.2–0.8 mm wide, flat or slightly concavo-convex distally, obtuse at apex; petals 5, white, linear-oblanceolate or narrow-obtrullate, 0.1–0.5 mm long, 0.1–0.3 mm wide, acute to obtuse, with margins minutely erose; ovary depressed globose, 0.4–1.1 mm across, shallowly to deeply 6-lobed, flat to slightly emarginate distally, smooth or papillose; styles each 0.2–0.7 mm long, deeply 2-partite, slender or rarely stout. Capsules depressed globose, 1.4–2.5 mm across, 0.6–1.4 mm long, prominently 6-lobed, slightly emarginate distally, slightly rugose. Seeds wedge-shaped, 0.4–1.1 mm long, 0.4–0.9 mm wide, 0.3–0.9 mm across; testa tuberculate, white.

***Selected specimens (from 600 examined)*: Western Australia.** Hill River crossing on Brand Hwy, *c.* 6 km N of Badgingarra, Sep 1988, *Henderson H3135* (BRI); Peak Eleanora, Peak Charles NP, *c.* 45 km W of Salmon Gums, Nov 1979, *Newbey 6406* (PERTH); Cape Arid NP, E of Esperance, Dec 1971, *Royce 10149* (PERTH). **Northern Territory.** *c.* 15 km N of Borroloola on Bing Bong Homestead road, Jun 1976, *Craven 4243* (CANB); 105 km from Borroloola on Wollogorang road, May 1987, *Craven 8529 et al.* (CANB); Parakeelya swamp, 50 km SW of Nathan River Homestead, Aug 1985, *Latz 10203* (DNA). **South Australia.** Hambidge Flora and Fauna Reserve, Oct 1966, *Alcock 1138* (BRI, CANB); *c.* 5 km E along Casterton Road from the Nangwarry to Penola road, Oct 1989, *Henderson & Turpin H3312* (AD, BRI); near Comaum, *c.* 20 km E of Penola, Sep 1962, *Hunt 1170* (AD). **Queensland.** Cook District: Tinaroo Creek forestry road, 8.2 km past Henry Hannan Drive towards Mt Haig, Apr 1989, *Henderson & Clarkson H3218* (BRI). Darling Downs District: Girraween NP, 4.5 km ESE of Park Headquarters, Bald Rock Creek, Jan 1993, *Halford Q1593 et al.* (BRI, MEL). Moreton District: Old Logan Road, Camira, Apr 1992, *Sharpe 5310 & Bird* (BRI, MEL). **New South Wales.** *c.* 22 km NE of Emmaville on Amaroo road, Oct 1993, *Coveny 16652 & Whalen* (BRI, NSW); Tantawangalo State Forest, 12 km S of Tantawangalo, Apr 1993, *Crawford 2254* (CANB, MEL, NSW); on Wollar/Bylong road, *c.* 30 km SW of Merriwa, Sep 1990, *Henderson & Turpin H3409* (BRI). **Australian Capital Territory.** Mt Loch, Feb 1983, *Beardsell s.n.* (MEL 1562983); Mt Franklin, Brindabella Range, Mar 1957, *Pullen 73* (CANB). **Victoria.** Mt Samaria Road, *c.* 65 km NW of Bridge Creek township, Nov 1996, *Clarke 2753* (MEL); *c.* 6 km SE of Taggerty, Cathedral Range, Neds Gully camping area, Nov 1996, *Clarke 2726* (MEL); Gippsland Plains, Briagolong Forest Reserve, 500 m S of Cemetery Road and 300 m E of Briagolong-Stratford Road, Oct 1991, *Lunt 91/84* (MEL). **Tasmania.** Flinders Island, Strzelecki NP, 1.4 km SW of Strzelecki Peaks, Dec 1988, *Crawford 1136* (BRI, CANB); Wombat Moor, Jan 1948, *Curtis s.n.* (HO 6359); N of Bessells Road, Sale Rivulet, Dec 1983, *Patacsek s.n.* (HO72814); Mt Field National Park, Mt Field West, Feb 1969, *Telford EMC2227* (CANB).

***Distribution and habitat*:** *Poranthera microphylla* is widespread and is recorded in all Australian states though it is not found in the more arid regions of Australia. It also occurs in New Zealand. It is recorded as growing in a wide variety of habitats from coastal dunes to alpine mountain slopes in grassland, heathland, woodland and open forest communities on a range of substrates. **Map 10**.

***Phenology*:** Flowers and fruits have been collected throughout the year.

***Typification*:** In his protologue of *P. microphylla,* Brongniart cited two collections, namely "in Nova-Hollandia In Montibus Caeruleis near Port-Jackson (Lesson)" and "ad fretum Entrecasteaux (Vog. de Baudin, in herb. Mus. Par.)". Two sheets of the Lesson collection and one sheet of the Baudin collection have been located amongst material on loan to BRI from P, and are numbered 152754, 152755 and 152753 respectively. The Lesson specimen 152754 is selected here as lectotype of *Poranthera microphylla* as it is part of the original material, agrees with the protologue description and is more than likely the material illustrated in the protologue.

***Notes*:** *Poranthera microphylla* displays a large degree of morphological variation. However, the variants are not considered sufficiently distinct enough to warrant formal recognition here. In general, those plants from populations in the Kimberley in Western Australia, central Northern Territory and the Cook District in northern Queensland have more or less erect stems, linear leaves and generally comparatively smaller flowers, fruits and seeds than those of other forms; plants from south-western Western Australia and South Australia have a procumbent to erect habit and leaves narrow-obovate with a cuneate base; plants in eastern Australia, from north-eastern Queensland to Tasmania, generally have a sprawling to weakly ascending habit and spathulate leaves with an attenuate base.

There is also a high-altitude form in the Australian Alps and in the higher altitudes in

Tasmania which resembles *P. oreophila* and *P. petalifera* in having opposite leaves with more or less strongly revolute leaf margins and stout style branches. Some specimens of *P. microphylla* seem to possess a perennial rootstock (*e.g. Pullen 73* (CANB), *Beardsell s.n.* (MEL 1562983) and *Telford EMC2227* (CANB)). This form of *P. microphylla* differs from the other mentioned species by having monoecious rather than dioecious plants. It also differs from *P. oreophila* in having tuberculate rather than smooth seeds and from *P. petalifera* in having its flowers in terminal umbel-like racemes rather than being solitary in leaf axils.

11. Poranthera obovata Halford & R.J.F.Hend., **sp. nov**. ut videtur maxime arcte affinis *P. ericifoliae* Rudge sed foliis angustis obovatis vice linearibus usque angustis oblanceolatis, marginibus foliorum leviter recurvatis vice valide recurvatis usque revolutis et stipulis integris vice laciniatis distinguenda. **Typus:** Queensland. Moreton District: Helidon Hills, *c.* 10 km N of Helidon township, 7 Sep 1989, *R.J.F. Henderson H3231* (holo: BRI; iso: MEL, NSW, distribuendi).

Poranthera sp. (Beerwah D.Hassall DH7431), P.I. Forster & D.A. Halford (2002, p.73).

Monoecious, spreading to erect, herbaceous perennials to 20 cm high. Stems unbranched or sparingly branched; branchlets ascending to erect or rarely procumbent, smooth or papillose, glabrous, 1.5–2 mm across, with leaf scars prominent. Leaves sessile, alternate, crowded along branchlets; stipules white, narrow-ovate or narrow-triangular, 1.5–2 mm long, entire; laminae narrow-obovate, 10–15 mm long, 1.5–3 mm wide, flat with margins slightly recurved, smooth and glabrous adaxially and abaxially, discolorous; midrib impressed proximally adaxially, prominent abaxially; base attenuate; apex obtuse. Flowers in short dense terminal racemes; racemes solitary or rarely several in a leafy terminal corymb; peduncles 10–25 mm long; rachis 2–30 mm long; bracts narrow-obovate, 2–7 mm long, 0.5–1.3 mm wide, obtuse to rounded. Male flowers with pedicels 1.5–2.5 mm long; calyx lobes 5, white to pink or rarely with pale blue hue, obovate, 1.6–1.7 mm long, 0.5–0.7 mm wide, slightly concavo-convex, rounded at apex; petals 5, white or pale pink, erect, recurved distally, terete proximally, *c.* 0.5 mm long, to *c.* 0.1 mm across, acute, with margins entire; glands 2-lobed, 0.2–0.3 mm wide; stamens 5; filaments 1.4–1.5 mm long, slightly incurved; anthers 0.2–0.3 mm long; rudimentary ovary 3-lobed; lobes clavate, 0.5–0.6 mm long. Female flowers with pedicels 1.5–2 mm long, extending to *c.* 6 mm in fruit; calyx lobes 5, white to pink, oblong, 1.3–2.8 mm long, 0.6–0.7 mm wide, slightly concavo-convex, rounded at apex; petals 5 or sometimes absent, white or pink, subulate, 0.4–0.6 mm long, 0.1–0.2 mm wide, acute, with margins entire; ovary depressed globose, 1–1.8 mm across, deeply 6-lobed, emarginate distally, papillose; styles each *c.* 1 mm long, deeply 2-partite, slender. Capsules depressed globose, 2.8–3 mm across, 1.7–2 mm long; prominently 6-lobed distally, emarginate distally, papillose. Seeds wedge-shaped, 1.1–1.2 mm long, *c.* 2 mm wide, *c.* 2 mm across; testa reticulate-foveate with fovea white and ridges pale brown and translucent. **Fig. 4**.

***Selected specimens (from 30 examined)*: Queensland.** Port Curtis District: Kroombit Tops, State Forest 316, 48 km E of Biloela, Sep 1988, *Gibson TO1430* (BRI). Leichhardt District: Blackdown Tableland, *c.* 35 km SE of Blackwater, Sep 1971, *Henderson H967 et al.* (BRI, MEL); Mimosa Creek, Blackdown Tableland, Sep 1974, *Williams 74054* (BRI). Wide Bay District: Oakey Creek road, Blackall Range, Oct 1990, *Sharpe 4977 & Bean* (BRI). Moreton District: State Forest 893 Mt Mee, Aug 1995, *Forster PIF17391 & Leiper* (BRI, MEL, NSW); near Forestry Station, Beerwah, Jun 1974, *Hassall DH7431* (BRI); Mapleton Forestry Scenic Drive, *c.* 5 km N of Mapleton, Nov 1987, *Sharpe 4751 & Guymer* (BRI); Lockyer State Forest (SF616), Nov 1994, *Thompson & Bean MOR453* (BRI); at foot of Mount Beerburrum, Sep 1959, *Thurlow s.n.* (BRI [AQ205075]). **New South Wales.** 8 km NNW of Glenreagh, Oct 1990, *Bean 2453* (BRI); 7 km NNW of Glenreagh, Oct 1990, *Bean 2462* (BRI, CANB, K, MEL, NSW); Rocky Creek, 28 km from Grafton towards Coaldale, Feb 1995, *Bean 8357* (BRI, NSW).

***Distribution and habitat*:** *Poranthera obovata* occurs in eastern Australia from the Blackdown Tableland near Blackwater in central Queensland southwards to Glenreagh in northern New South Wales. It is recorded as growing in heath, open eucalypt woodland or forest communities in either shallow sandy soils usually overlying sandstone or gravelly sandy clays. **Map 11**.

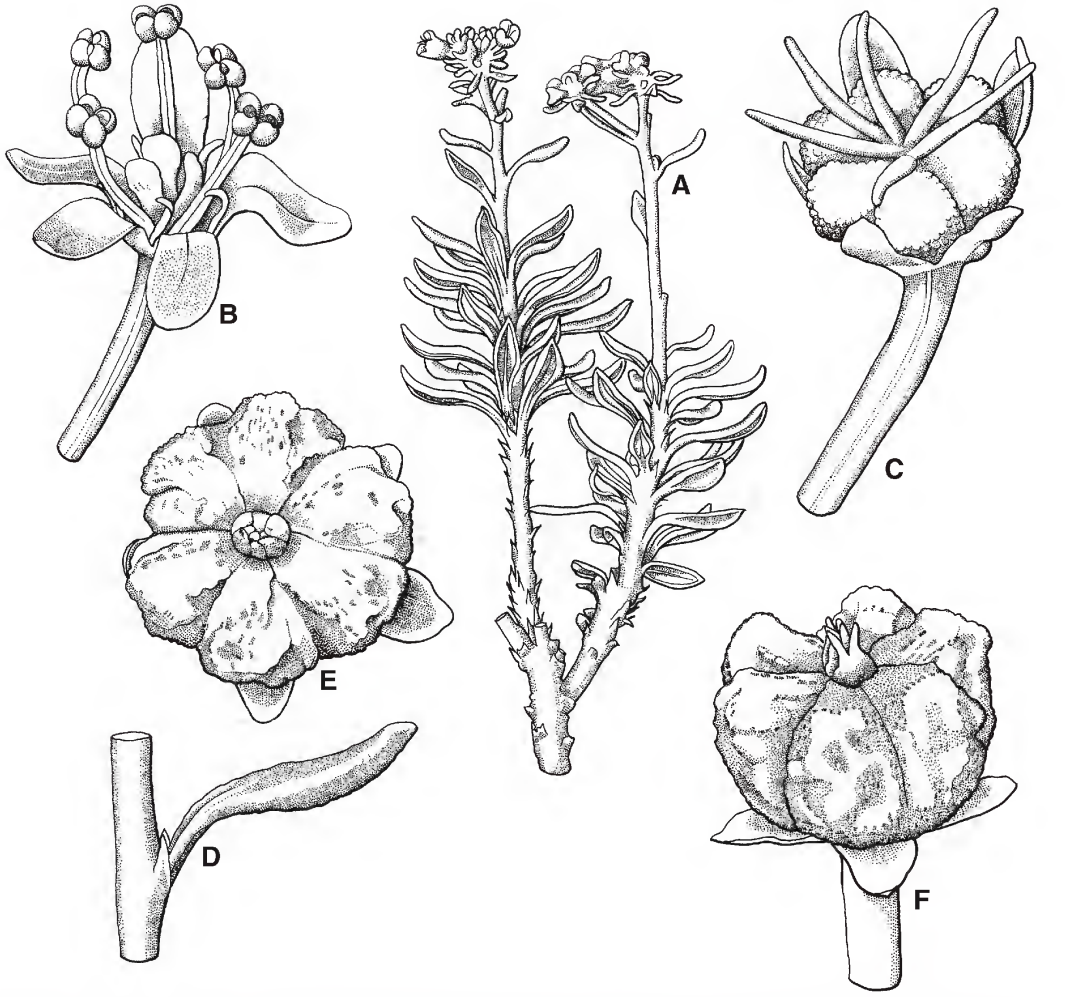


Fig. 4. ***Poranthera obovata.*** A. branchlet with flowers ×2. B. male flower ×16. C. female flower ×16. D. branchlet with leaf and stipules ×8. E. fruit from above ×12. F. fruit from side ×12. A, D from *Sharpe 4977 & Bean* (BRI); B, C, E, F from *Henderson H3588* (BRI). Del. W. Smith.

***Phenology*:** Flowers have been collected in February, April, June and from August to December, fruits in February, April, June, September, October and December.

***Affinities*:** *Poranthera obovata* seems most closely related to *P. ericifolia* but is distinguished from that by its narrow-obovate rather than linear to narrow-oblanceolate leaves, slightly recurved rather than strongly recurved to revolute leaf margins and entire rather than laciniate stipules.

***Etymology*:** The specific epithet is derived from Latin, *obovatus*, obovate, in reference to the shape of the species' leaves.

12. Poranthera oreophila Halford & R.J.F.Hend., **sp. nov.** olim *P. microphylla* Brongn. confusa sed plantis dioeciis, seminibus testa laevi et pallide brunnea distinguenda. *P. oreophila* ut videtur maxime arcte affinis *P. petaliferae* (Orchard & J.B.Davies) Halford & R.J.F.Hend. autem floribus in racemis terminalibus dispositis et floribus masculis plerumque minoribus distinguenda. **Typus:** New South Wales. Kosciusko N.P., Gurrangorambla Range, Mount Morgan, 12 Jan 1994, *A.E. Jenkinson 3 & D.K. Judge* (holo: CANB; iso: BRI, MEL, NSW).

Dioecious, compact herbaceous perennials to 30 cm high. Stems sparingly branched; branchlets annual, prostrate or weakly ascending, ± smooth, glabrous; 0.7–1.1 mm across, with leaf scars obscure. Leaves sessile or shortly petiolate, opposite, widely spaced along branchlets; petioles 0.2–0.5 mm long; stipules white, narrow-triangular, 0.5–1 mm long, entire; laminae narrow-ovate, narrow-obovate or narrow-elliptic, 4.3–6.5 mm long, 1.8–3.8 mm wide, flat or rounded with margins recurved to revolute, smooth and glabrous adaxially and abaxially, discolorous; midrib impressed proximally adaxially, slightly raised proximally abaxially; base attenuate; apex acute to obtuse. Flowers in short dense terminal racemes; racemes solitary; peduncles 5–10 mm long; rachis 2–4 mm long; bracts narrow-obovate, 1.1–2 mm long, 0.5–1.1 mm wide, obtuse. Male flowers with pedicels 0.5–0.7 mm long; calyx lobes 5, white, obovate or oblong, 0.9–1.1 mm long, 0.5–0.9 mm wide, ± flat; rounded at apex; petals 5, white, erect, recurved distally, oblanceolate, 0.4–0.5 mm long, 0.1–0.2 mm wide, acute, with margins ± entire; glands 2-lobed or subglobose, 0.2–0.4 mm wide; stamens 5; filaments 0.5–0.9 mm long, ± straight; anthers *c.* 0.1 mm long; rudimentary ovary 3-lobed, lobes clavate, 0.2–0.3 mm long. Female flowers with pedicels up to 1.1 mm long, extending to 7 mm long in fruit; calyx lobes 5, white sometimes with mauve tinge, oblong to oblong-obovate, 1.1–1.2 mm long, 0.8–0.9 mm wide, flat, rounded at apex; petals 5, white, linear-oblanceolate, 0.2–0.6 mm long, 0.1–0.2 mm wide, acute, with margins entire; ovary depressed globose, 1–1.3 mm across, shallowly 6-lobed, emarginate distally, smooth or papillose; styles each 0.5–0.6 mm long, deeply 2-partite, stout. Capsules depressed globose, 1.7–2.2 mm across, 1.2–1.4 mm long, shallowly 3-lobed, emarginate distally, ± smooth. Seeds wedge-shaped, 0.9–1 mm long, 0.6–0.7 mm wide, 0.8–0.9 mm across; testa smooth, pale brown or white. **Fig. 5**.

***Selected specimens (from 40 examined)*: New South Wales.** Kiandra, 0.5 miles (*c.* 0.8 km) SW of road junction, Feb 1969, *Briggs 2523* (NSW); Kosciusko N.P., 2 miles (*c.* 3.2 km) from Grey Mare Track junction with Happy Jacks Road, toward Happy Jacks Pondage, Jan 1966, *Carroll* 150A (CANB); Jindabyne, Mar 1907, *Hallman s.n.* (NSW455328); Grey Mare Range, *c.* 2.4 km SW of Grey Mare Hut, Feb 1968, *Rodd 712* (NSW); Rule's Point N of Kiandra, Jan 1969, *Salasoo 3503* (NSW); Kosciusko NP, Little Peppercorn Plain, Feb 1981, *Taylor 1309 et al.* (CANB); Snowy River between Guthega Dam and Spencers Creek, Jan 1971, *Thompson 1008* (NSW); Cooleman Plain, Dec 1962, *Walker ANU952* (CANB). **Australian Capital Territory.** between Mt Gingera and Blackfellows Gap, May 1959, *Burbidge 6398 & Gray* (CANB); Mt Gingera, Feb 1953, *Moore 2323* (CANB); east slope of Mt Gingera, Brindabella Range, Nov 1966, *Schodde 5159* (CANB, K, NSW). **Victoria.** Bogong High Plains, Wilkinson Memorial Lodge area, Jan 1966, *Beauglehole ACB15421* (MEL, NSW); near Cope Hut, Bogong High Plains, Feb 1972, *Craven 2184* (CANB); Bogong High Plains, Nelse Track, Jan 1982, *Forbes 774 & van Rees* (MEL); Bogong NP, footslopes of Mt Nelse beside track, Feb 1985, *Norris 302* (NSW); Digges' Holes, Nunniong Plateau, Jan 1949, *Wakefield 2665* (MEL); Mt Cobberas, Feb 1974, *Willis s.n.* (MEL2062983); Cobberas Mountains, between No. 1 summit and Asses Ears, Feb 1975, *Willis s.n.* (MEL2062982).

***Distribution and habitat*:** *Poranthera oreophila* occurs in alpine areas of south-eastern Australia from the Brindabella Range in the Australian Capital Territory, through Kosciusko National Park, New South Wales, to Nunnjong Tableland and Bogong High Plains, Victoria. It is recorded as growing mostly in stony clay loam soils in alpine tussock grassland and herbfield communities, at altitudes higher than 1300 metres. **Map 12**.

***Phenology*:** Flowers and fruits have been collected from November to May.

***Affinities*:** *Poranthera oreophila* has been identified as *P. microphylla* in the past but can be distinguished from that species by being dioecious and having smooth light brown seeds. *Poranthera oreophila* seems most closely related to *P. petalifera* but can be distinguished from that by having its flowers in terminal racemes and its generally smaller male flowers. *Poranthera oreophila* is similar to the New Zealand endemic *P. alpina* but can be distinguished from that by having its flowers in short dense terminal racemes, both the male and female flowers possessing petals and male flowers with a vestigial ovary.

***Etymology*:** The specific epithet is derived from Greek, *oreo-*, mountain, and *philus*, loving, in reference to the species' habitat.

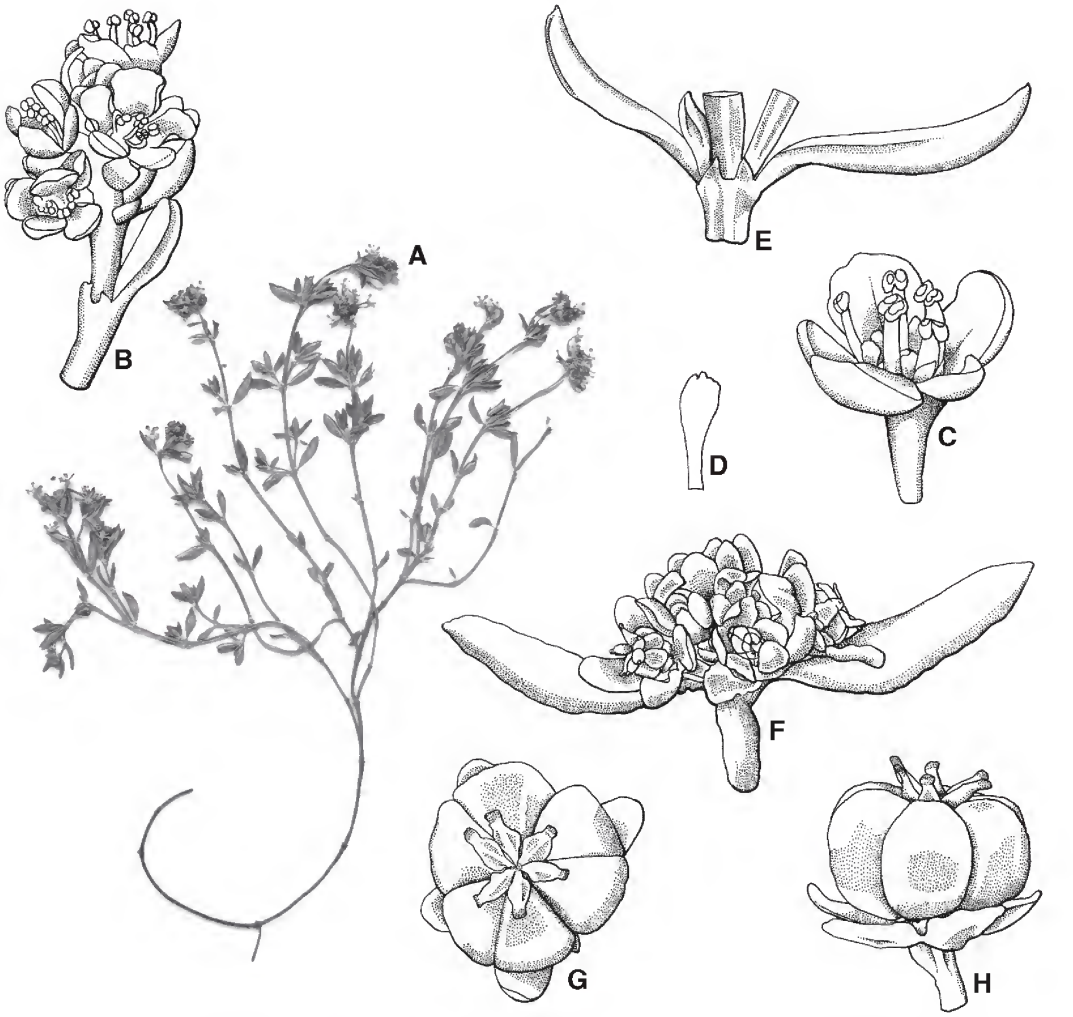


Fig. 5. ***Poranthera oreophila.*** A. branchlet with flowers and fruit ×0.8. B. inflorescence of male flowers ×8. C. male flower ×16. D. petal from male flower ×32. E. branchlet with leaves and stipules ×6. F. inflorescence of female flowers ×8. G. fruit from above ×12. H. fruit from side ×12. A from *Moore 2323* (CANB); B-E from *Forbes 774 & van Rees* (MEL); F-H from *Briggs 2523* (NSW). Del. W. Smith.

13. Poranthera petalifera (Orchard & J.B.Davies) Halford & R.J.F.Hend., **comb. nov.,** *Oreoporanthera petalifera* Orchard & J.B.Davies, *Pap. & Proc. Roy. Soc. Tasmania* 119: 62/63 (1985). **Type:** Tasmania. NE ridge of Mt Anne, 31 Dec 1984, *J.B. Davies 31* (holo: HO *n.v.*; iso: CHR *n.v.*, MEL).

***Illustrations*:** Orchard & Davies (1985: fig. 1), as *Oreoporanthera petalifera*; J. Kirkpatrick (1997: fig. 45c), as *Oreoporanthera petalifera.*

Dioecious, compacted herbaceous perennials to 30 cm high and to 20 cm across. Stems much branched; branchlets decumbent, smooth, glabrous, 0.6–0.9 mm across, with leaf scars obscure. Leaves shortly petiolate, opposite, crowded or widely spaced along branchlets; petioles up to 1 mm long; stipules white, narrow-triangular, 0.8–1.2 mm long, entire; laminae lanceolate or narrow-obovate, 3.5–7.1 mm long, 0.8–1.7 mm wide, rounded with margins strongly revolute to midrib, smooth and glabrous adaxially and abaxially, discolorous; midrib obscure adaxially, slightly raised proximally

abaxially; base attenuate; apex acute. Flowers solitary in upper leaf axils. Male flowers with pedicels 0.9–2.6 mm long; calyx lobes 5, white, oblong or obovate, 1.1–2 mm long, 0.6–0.8 mm wide, ± flat, rounded at apex; petals 5, white, erect, incurved distally, oblanceolate, 0.6–0.7 mm long, 0.1–0.2 mm wide, acute, with margins entire; glands subglobose, 0.3–0.4 mm wide; stamens 5; filaments 0.8–1.2 mm long, incurved; anthers 0.3–0.4 mm long; rudimentary ovary 3–lobed; lobes clavate, 0.2–0.3 mm long. Female flowers with pedicels up to 1 mm long, extending to *c.* 4 mm in fruit; calyx lobes 5, white, oblong to oblong-obovate, 0.9–2.2 mm long, 0.6–0.9 mm wide, slightly concavo-convex, rounded at apex; petals 5, white, linear-oblanceolate or narrow-ovate, 0.2–0.6 mm long, 0.1–0.3 mm wide, acute or obtuse, with margins ± entire; ovary globose, *c.* 0.6 mm across, shallowly 6-lobed, flat distally, smooth; styles each *c.* 0.2 mm long, 2-partite, stout. Capsules depressed globose, *c.* 2 mm across, *c.* 1.2 mm long, shallowly 3-lobed, emarginate distally, smooth. Seeds subglobose, 0.8–0.9 mm long, 0.7–0.8 mm across; testa faintly tuberculate, white or orange brown.

***Additional specimens examined*: Tasmania.** NE ridge of Mount Anne, Jun 1984, *Buchanan & Davies 3725* (HO); *loc. cit.*, Dec 1984, *Buchanan 5101, 5102, 5103, 5116, 5117, 5119* (HO); Mt Anne, Feb 1989, *Croft 10176 & Richardson* (CANB).

***Distribution and habitat*:** *Poranthera petalifera* is confined to Mount Anne in south-western Tasmania, occuring at altitudes from 800 to 1000 m above sea level. It is recorded as growing in crevices of exposed dolomite rocks in dwarf subalpine rainforest. **Map 13**.

***Phenology*:** Flowers have been collected in December and February, fruits in June.

***Affinities*:** *Poranthera petalifera* seems most closely related to *P. oreophila* and the New Zealand endemic *P. alpina*. It can be distinguished from the former by having its flowers borne singly in the axils of the upper leaves and generally by the larger male flowers. For comments on the distinguishing features of *P. petalifera* from *P. alpina*, see Orchard & Davies (1985).

14. Poranthera triandra J.M.Black, *Trans. & Proc. Roy. Soc. South Australia* 40: 66-67, t.7 (1916). **Type:** [South Australia.] Yeelanna, Nov 1915, *T.G.B. Osborn s.n.* (holo: AD977512A; iso: AD9775128B, K).

***Illustration*:** Weber (1986: 764, fig. 408).

Monoecious, compact annuals to 3 cm high. Stems much branched; branchlets procumbent or erect, smooth, glabrous, up to 0.5 mm across, with leaf scars obscure. Leaves ± sessile, alternate or opposite, widely spaced along branchlets; stipules white sometimes with red-brown striations, narrow-triangular, 0.5–1 mm long, entire; laminae narrow-obovate to obovate or narrow-elliptic to elliptic, 2–5.5 mm long, 0.9–2.2 mm wide, flat, smooth and glabrous adaxially and abaxially, concolorous; midrib obscure adaxially, slightly raised proximally abaxially; base attenuate; apex obtuse to rounded. Flowers in short dense terminal umbel-like racemes; racemes solitary or several in a leafy terminal corymb; peduncles 5–10 mm long; rachis 1–2 mm long; bracts narrow-obovate, 1–1.5 mm long, 0.4–0.5 mm wide, obtuse to rounded. Male flowers with pedicels 0.3–0.6 mm long; calyx lobes 3(rarely 4 or 5), pink sometimes with reddish striations, oblong or broadly ovate, 0.4–0.5 mm long, 0.1–0.5 mm wide, concavo-convex, rounded at apex; petals 3, white, erect, ovate, 0.1–0.5 mm long, up to 0.2 mm wide, obtuse to rounded, with margins entire; glands obscure; stamens 3; filaments 0.2–0.3 mm long, straight; anthers up to 0.1 mm long; rudimentary ovary minute, hemispherical. Female flowers with pedicels *c.* 0.3 mm long, extending to *c.* 3 mm long in fruit; calyx lobes 3(rarely 4 or 5), white with red-brown striations, oblong-elliptic or ovate, 0.5–0.6 mm long, 0.2–0.5 mm wide, slightly concavo-convex, obtuse or sometimes acute at apex; petals absent or 3, when present white, subulate, *c.* 0.3 mm long, *c.* 0.05 mm wide, acute, with margins entire; ovary depressed globose, 0.5–0.9 mm across, deeply 6-lobed, emarginate distally, smooth or slightly papillose; styles each 0.1–0.2(–0.4) mm long, shortly divided distally or rarely 2-partite, stout or rarely slender. Capsules depressed globose, 0.9–1.3 mm across, 0.5–0.8 mm long, prominently 6-lobed, emarginate distally, smooth or papillose. Seeds wedge-shaped, 0.4–0.6 mm long, 0.3–0.4 mm wide, 0.3–0.4 mm across; testa granulate, white or pale brown with white protuberances.

***Selected specimens* (*from 20 examined*): Western Australia.** Eucla, in 1889, *Batt s.n.* (MEL2065675, 2065674); 4.7 km S of Sunrise Hill road, east boundary of reserve 33113, Oct 1984, *Burgman 4485* (PERTH); 21.7 km due SSE of Peak Eleanora, Sep 1984, *Burgman 3599B* (PERTH); Parker Range, in 1890, *Merrall s.n.*

(MEL2065535); Jimberlana Hill, 9 km NE of Norseman, Aug 1980, *Newbey 7194* (PERTH); Middle Island, Recherche Archipelago, Nov 1973, *Weston 8760 & Trudgen* (PERTH); Middle Island, Recherche Archipelago, Nov 1950, *Willis s.n.* (MEL2063002). **Northern Territory.** Reedy Creek Gorge, 4 miles (*c.* 6.4 km) E of Kings Canyon, George Gill Range, Oct 1966, *Beauglehole ACB20473B* (NSW); near Reedy Rockhole, George Gill Range, Jul 1981, *Thomson 86* (DNA). **South Australia.** Well E of Meningie, Oct 1965, *Beauglehole ACB14474 & Williams* (AD, MEL, NSW); Monarto South, *c.* 15 km W of Murray Bridge, Nov 1945, *Cleland s.n.* (AD96005033); *c.* 60 km SE of Adelaide, Oct 1958, *Eichler 15061* (AD); S of Port Rickaby, Yorke Peninsula, Oct 1980, *Heyligers 80162* (CANB); Lucindale, *c.* 35 km W of Naracoorte, Nov 1934, *Ising s.n.* (AD97409341); near Murray Bridge, Sep 1973, *Smith 2414* (AD); *c.* 15 km W of Murray Bridge on Adelaide-Melbourne railway, Sep 1974, *Spooner 3573* (AD); Kangaroo Island, 1886, *Tepper s.n.* (MEL2065666). **Victoria.** Grampians, in 1892, *Walter s.n.* (MEL694310).

***Distribution and habitat*:** *Poranthera triandra* occurs in scattered populations from near Esperance, Lake King and Eucla in Western Australia, Kangaroo Island, Yorke Peninsula and Murray Bridge in South Australia, George Gill Range in the Northern Territory, and the Grampians, Victoria. It is recorded as growing in open eucalypt woodland, low shrubland or open mallee communities in sandy or loamy sand soils. **Map 14**.

***Phenology*:** Flowers and fruits have been collected from July to November

***Notes*:** The Central Australia collections *Thomson 86* (DNA) and *Beauglehole ACB20473B* (NSW) are from populations somewhat isolated from the others of this species. These specimens differ from others of the species in having a colliculate rather than granulate seed surface and the calyx lobes of its female flowers are narrower than those observed in other collections. They also lack the reddish-brown marks that are prominent in other dried specimens of *P. triandra*. These specimens are tentatively included here within our concept of *P. triandra* but further collections and field studies are warranted to establish their correct identity.

Excluded Names

Poranthera microphylla var. procera Grüning in A.Engler, *Pflanzenr.* Heft 58: 18 (1913). **Type citation:** 'Western Australia. Swan River (Drummond without number in Herb. Berol.)'(holo: B (? destroyed)).

Type material appears non existent rendering the correct placement of this name impossible for us at this stage. From the protologue description it is most probably a synonym of *Poranthera microphylla.*

Poranthera glauca Klotzsch in J.G.C. Lehmann, *Pl. Preiss.* 2: 231 (1848); *Poranthera ericoides* var. *glauca* (Klotzsch) Domin, *Vestn. Kral. Ceske Spolecn. Nauk. Tr. Mat.-Prir. (Mem. Soc. Roy. Sci. Boheme, Prague)* 1921/2(2): 58 (1923). **Type citation:** [Western Australia.] 'In arenosis ad fluvium Cygnorum J. Drummond a. 1839 Herb. Preiss. sine No.' (holo: ?).

We have been unable to locate any type material rendering the correct placement of this name impossible for us at this stage. From the protologue description it is most probably a synonym of *Poranthera huegelii.*

Acknowledgements

We would like to thank Dr Gordon Guymer for making space and facilities available at BRI for the first author; the directors and curators of AD, B, CANB, DNA, HO, K, LD, MEL, NE, NSW, PERTH for loan of their holdings of *Poranthera* material for study at BRI; Alex Chapman and Bob Chinnock for searching for types on our behalf at E and BM while acting as Australian Botanical Liaison Officer at K, Les Pedley and Peter Bostock (BRI) for assistance in translation of diagnoses into Latin, Will Smith (BRI) for the excellent illustrations and Peter Bostock for the maps. Associated fieldwork from 1988 to 1992 by the second author and salary support for the first author from 1999 and 2000 was funded by grants from the Australian Biological Resources Study (ABRS) which are gratefully acknowledged.

References

Baillon, H.E. (1858). *Étude générale du groupe des Euphorbiacées.* Victor Masson: Paris.

Baillon, H.E. (1866). Species Euphorbiacearum Euphorbiacées Australiensis. *Adansonia* 6: 282–345.

Bentham, G. (1873). Euphorbiaceae. In *Flora Australiensis* 6: 41–153. L. Reeve & Co.: London.

Black, J.M. (1916). Additions to the Flora of South Australia no. 9. *Transactions and Proceedings of the Royal Society of South Australia* 40: 56–77.

Brongniart, A.T. (1833). Note sur quelques Euphorbiacées de la Nouvelle-Hollande. *Annales de sciences naturelles. (Paris)* 29: 382–387.

Brummitt, R.K. & Powell, C.E. (1992). *Authors of Plant Names.* Royal Botanic Gardens: Kew.

Cheeseman, T.F. (1925). *Manual of the New Zealand Flora*. W.A.G. Skinner, Government Printer: Wellington.

Corrick, M.G. & Fuhrer, B.A. (2000). *Wildflowers of Victoria and adjoining areas.* Victoria: Bloomings Books: Hawthorn.

Cunningham, G.M., Mulham, W.E., Milthorpe, P.L. & Leigh, J.H. (1982). *Plants of Western New South Wales.* New South Wales Government Printing Office: Sydney.

Dallwitz, M.J., Paine, T.A. & Zurcher, E.J. (1993). *DELTA user's guide, a general system for processing taxonomic descriptions*, 4th edn. CSIRO: East Melbourne.

Dunlop, C.R., Leach, G.J. & Cowie, I.D. (1995). *Flora of the Darwin Region*. Conservation Commission of the Northern Territory: Darwin.

Forster, P.I. & Halford, D.A. (2002). *Poranthera*. In R.J.F. Henderson (ed.), *Names and Distribution of Queensland Plants, Algae and Lichens,* p.73. Queensland Herbarium, Queensland Government Environmental Protection Agency: Brisbane.

Grüning, G. (1913). *Poranthera*. IV. 147 Euphorbiaceae – *Porantheroideae et Ricinocarpoideae*. In A. Engler (ed.), *Das Pflanzenreich, Regni vegetabilis conspectus* H.58: 13–21. Verlag von Wilhelm Engelmann: Leipzig.

Holmgren, P.K., Holmgren, N.H. & Barnett, L.C. (1990). Index Herbariorum Part 1, 7th edn. *Regnum Vegetabile* 106.

Hooker, J.D. (1881). *Poranthera alpina. Hooker's Icones Plantarum* 14: 49–50.

Hutchinson, J. (1969). Tribalism in the family Euphorbiaceae. *American Journal of Botany* 56: 738–758.

James, J.A. & Harden, G.J. (1990). *Poranthera.* In G.J. Harden (ed.), *Flora of New South Wales* 1: 394. New South Wales University Press: Kensington.

Jeanes, J.A. (1999). *Poranthera*. In N.G. Walsh & T.J. Entwisle (eds), *Flora of Victoria* 4: 71–72. Inkata Press: Melbourne.

Kenneally, K.F., Edinger, D.C. & Willing, T. (1996). *Broome and Beyond: plants and people of the Dampier Peninsula, Kimberley, Western Australia*. Department of Conservation and Land Management: Como, Western Australia.

Kirkpatrick, J. (1997). *Alpine Tasmania: an illustrated guide to the flora and vegetation.* Oxford Press: Melbourne.

Klotzsch, J.F. (1848). *Poranthera.* In J.G.C. Lehmann (ed.), *Plantae Preissianae* 2: 230–232. Meissner: Hamburg.

Marchant, N.G. (1990). The Western Australian collecting localities of J.A.L. Preiss. In P.S. Short (ed.), *The history of systematic botany in Australasia*, pp. 131–136. Australian Systematic Botany Society Inc.: Melbourne.

McKee, H.S. (1963). The Bleeser botanical collection from northern Australia. *Contributions from the New South Wales National Herbarium* 3: 233–234.

Müller, J. (1866). Euphorbiaceae. In A.L.P.P. de Candolle (ed.) *Prodromus Systematis Naturalis Regni Vegetabilis.* 15(2): 189–214. Masson: Paris.

Orchard, A.E. & Davies, J.A. (1985). *Oreoporanthera,* a New Zealand "Endemic" plant genus discovered in Tasmania. *Papers and Proceedings of the Royal Society of Tasmania* 119: 61–63.

Orchard, A.E. (1999). A history of systematic botany in Australia. *Flora of Australia,* 2nd edn, 1: 11–104. CSIRO Publishing: Melbourne.

Rudge, E. (1811). A description of several species of plants from New Holland. *The Transactions of the Linnean Society of London* 10: 283–303.

Schwarz, O. (1927). Plantae novae vel minus cognitae Australiae tropicae. *Repertorium Specierum Novarum Regni Vegetabilis* 24: 87.

Sonder, O.W. (1857). Plantae Muellerianae - Euphorbiaceae. *Linnaea* 28: 562–567.

Webb, C.J., Sykes, W.R. & Garnock-Jones, P.J. (1988). *Flora of New Zealand* 4: 623. Botany Division, D.S.I.R.: Christchurch.

Weber, J.Z. (1986). Euphorbiaceae. In J.P. Jessop & H.R. Toelken (eds), *Flora of South Australia*, 4th edn, 2: 735–768. South Australian Government Printing Division: Adelaide.

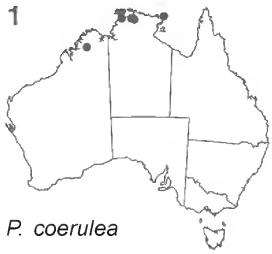
Webster, G.L. (1994). Synopsis of the genera and suprageneric taxa of Euphorbiaceae. *Annals of the Missouri Botanical Garden* 81: 33–144.

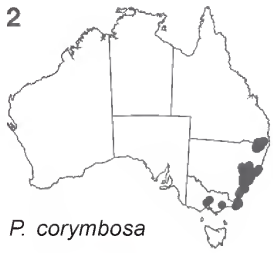
Wheeler, J.R. (1992). Euphorbiaceae. In J.R. Wheeler (ed.), *Flora of the Kimberley Region*, pp. 589–629. Department of Conservation and Land Management: Como, Western Australia.

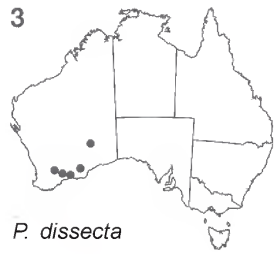
Index to Scientific Names

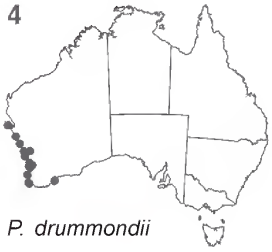
Names in bold type are accepted names and those in Roman font are synonyms or invalid names.

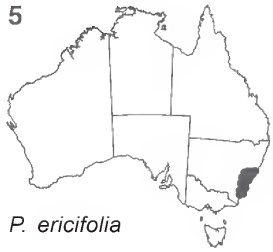
Oreoporanthera Hutch. ... 3
Oreoporanthera petalifera Orchard & J.B.Davies 23
Poranthera arbuscula Sond. ... 5
Poranthera coerulea O.Schwarz ... 4
Poranthera corymbosa Brongn. ... 5
Poranthera corymbosa Brongn. var. *corymbosa* ... 5
Poranthera corymbosa var. *arbuscula* (Sond.) Müll.Arg. ... 5
Poranthera corymbosa var. *genuina* Müll.Arg. ... 5
Poranthera corymbosa var. *linarioides* Grüning ... 5
Poranthera corymbosa var. *sparsifolia* Grüning ... 6
Poranthera dissecta Halford & R.J.F.Hend. ... 7
Poranthera drummondii Klotzsch ... 4
Poranthera ericifolia Rudge ... 10
Poranthera ericoides Klotzsch ... 11
Poranthera ericoides Klotzsch var. *ericoides* ... 11
Poranthera ericoides var. *glauca* (Klotzsch) Domin ... 24
Poranthera ericoides var. *typica* Domin ... 11
Poranthera florosa Halford & R.J.F.Hend. ... 12
Poranthera glauca Klotzsch ... 24
Poranthera huegelii Klotzsch ... 13
Poranthera leiosperma Halford & R.J.F.Hend. ... 15
Poranthera linearoides Baill. ... 5
Poranthera microphylla Brongn. ... 16
Poranthera microphylla Brongn. var. *microphylla* 16
Poranthera microphylla var. *diffusa* Ewart ... 17
Poranthera microphylla var. *diffusa* Müll.Arg. ... 16
Poranthera microphylla var. *drummondii* (Klotzsch) Müll.Arg. ... 8
Poranthera microphylla var. *genuina* Müll.Arg. ... 16
Poranthera microphylla var. *glauca* Müll.Arg. ... 17
Poranthera microphylla var. *intermedia* Müll.Arg. 12
Poranthera microphylla var. *procera* Grüning ... 24
Poranthera obovata Halford & R.J.F.Hend. ... 19
Poranthera oreophila Halford & R.J.F.Hend. ... 20
Poranthera petalifera (Orchard & J.B.Davies) Halford & R.J.F.Hend. ... 22
Poranthera piceoides Klotzsch ... 11
Poranthera Rudge ... 3
Poranthera Rudge subgen. *Poranthera* ... 3
Poranthera subgen. *Euporanthera* Grüning ... 3
Poranthera subgen. *Oreoporanthera* Grüning ... 3
Poranthera triandra J.M.Black ... 23

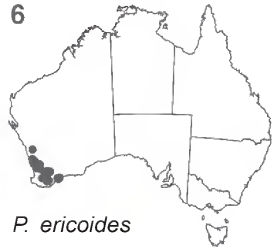


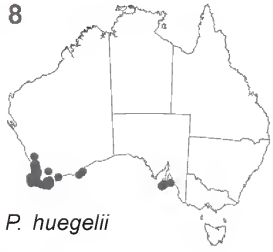


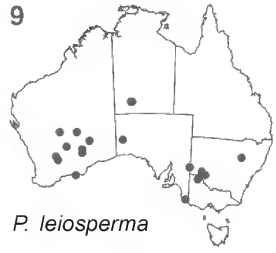


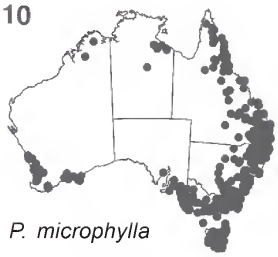


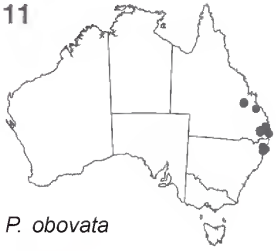


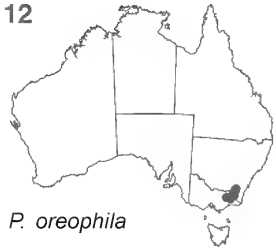


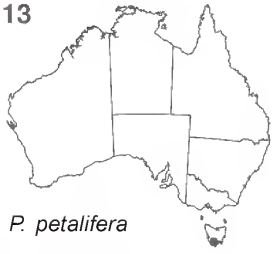


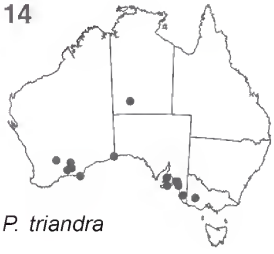












Maps 1-14. Distribution of *Poranthera* species.

A taxonomic revision of *Tarenna* Gaertn. and *Triflorensia* S.T.Reynolds (Rubiaceae: *Ixoroideae*: *Pavetteae*) in Australia

S.T. Reynolds & Paul I. Forster

Summary

Reynolds, S.T. & Forster, P.I. (2005). A taxonomic revision of *Tarenna* Gaertn. and *Triflorensia* S.T.Reynolds (Rubiaceae: *Ixoroideae*: *Pavetteae*) in Australia. *Austrobaileya* 7(1): 29–55. Revisions are presented for the Australian representatives of *Pavetteae* excluding the genus *Pavetta* L., *viz. Tarenna* Gaertn. (three species, two subspecies) and *Triflorensia* S.T.Reynolds (three species). The following are described as new, *Triflorensia* S.T.Reynolds genus nov., *Tarenna* subgenus *Pacifica* S.T.Reynolds subg. nov. and *Tarenna monticola* S.T.Reynolds & P.I.Forst. sp. nov. New combinations are made in *Tarenna* for *T. pentamera* (Benth.) S.T.Reynolds and *T. dallachiana* subsp. *expandens* (F.Muell. ex Benth.) S.T.Reynolds & P.I.Forst. and in *Triflorensia* for three species previously included in *Diplospora* or *Tarenna, viz. T. australis* (Benth.) S.T.Reynolds, *T. cameronii* (C.T.White) S.T.Reynolds and *T. ixoroides* (F.Muell.) S.T.Reynolds. Lectotypes are selected for several names. All recognised taxa are described with notes on their affinities, habitat, distribution, conservation status and etymology. Keys to taxa, distribution maps and line drawings of some of the taxa are also provided.

Key Words: Rubiaceae, *Tarenna* subgenus *Tarenna*, *Tarenna* subgenus *Pacifica*, *Tarenna dallachiana* subsp. *expandens*, *Tarenna monticola*, *Tarenna pentamera*, *Triflorensia australis*, *Triflorensia cameronii*, *Triflorensia ixoroides*, Australian flora

S.T.Reynolds & P.I.Forster*, Queensland Herbarium, Environmental Protection Agency, Brisbane Botanic Gardens, Mt Coot-tha Road, Toowong, Queensland 4066, Australia. *author for correspondence. Email: paul.forster@epa.qld.gov.au

Introduction

The classification of the genera and suprageneric taxa of Rubiaceae remains in a state of flux in the light of proposed phylogenies based on both morphological and molecular data sets. The formal classification of genera into subfamilies, tribes and subtribes within Rubiaceae was last comprehensively reviewed by Robbrecht (1988) with additions five years later (Robbrecht 1993), but since then there have been a number of wide ranging phylogenetic studies, primarily using molecular data, with results that have challenged this morphologically based classification (e.g. Andreasen *et al.* 1999; Bremer *et al.* 1999; Andreasen & Bremer 2000).

In the current paper a revision is presented of the Australian species of *Tarenna* Gaertn., together with the description and revision of a new genus *Triflorensia* S.T.Reynolds that is endemic to Australia and proposed to be closely allied to *Tarenna* and also to *Pavetta* L. (see Reynolds 1993). All three of these genera belong in the subfamily *Ixoroideae*, with both *Pavetta* and *Tarenna* being grouped with *Dictyandra* Welw. ex Hook.f., *Leptactina* Hook.f. and *Rutidea* DC. in the tribe *Pavetteae* A.Rich. ex Dumort. (tribal description given below) on the basis of both morphological and molecular data sets (Andreasen & Bremer 2000). In the earlier classification of Robbrecht (1988), *Pavetta* and *Tarenna,* together with *Duperrea* Pierre ex Pitard., *Ixora* L., *Myonima* Comm. ex Juss. and *Versteegia* Valeton were all included in a polyphyletic *Pavetteae*.

Tarenna has long been treated in a broad sense by various authors including Bridson (1979), Bridson & Robbrecht (1985) and Smith and Darwin (1988). Bridson (1979) recognised six informal groups under *Tarenna s.l.* based mainly on placentation and seed types, for the African species. The Australian species fall into three 'groups' based more or less on the same characters used by Bridson (1979), two of these are retained under *Tarenna*, whereas one is transferred to the closely related genus *Triflorensia*.

Accepted for publication 30 June 2005

Coffea L., *Discospermum* Dalzell, *Psilanthus* Hook.f. and *Tricalysia* A.Rich. ex DC. (Andreasen & Bremer 2000). An account of the Australian genera and species of *Coffeeae* was provided by Forster (2004).

The three species transferred to *Triflorensia* have had a chequered nomenclatural history, starting in *Diplospora* DC. (Bentham 1867; Mueller 1875; White 1926) and most recently being combined in *Tarenna* (Ali & Robbrecht 1991). The genus *Diplospora* is now restricted to species found in Asia and Malesia and is included in the tribe *Coffeeae* DC. together with *Bertiera* Aublet., *Coffea* L., *Discospermum* Dalzell, *Psilanthus* Hook.f. and *Tricalysia* A.Rich. ex DC. (Andreasen & Bremer 2000). An account of the Australian genera and species of *Coffeeae* was provided by Forster (2004).

Materials and Methods

The initial draft of this revision was undertaken by the first author prior to 1998. It has been updated in 2005 by the second author, particularly in terms of introductory information about recent generic phylogenies and new data pertaining to species distribution, habitat and conservation status.

The revision is based on morphological characters derived from herbarium specimens (dried sheets, spirit material) at BRI, CANB, DNA, K, NSW and QRS examined by the first author, with supplementary observations and measurements by the second author of specimens accessioned at BRI since 1995. Measurements encompass the main range of variation, with aberrant or unusual data indicated in brackets, e.g. (8–) 12–15.

Common abbreviations in the specimen citations are L.A. (= Logging Area), N.P. (= National Park), S.F. (= State Forest), S.F.R. (= State Forest Reserve) and T.R. (= Timber Reserve).

Species are defined as groups of populations (1-many) with discontinuities in the variation of two or more independent character states of morphology. It is assumed that there is genetic continuity or at least a shared ancestral lineage between the different populations of a single species. Although species definitions remain a matter of opinion and debate, the one applied here ('phenetic species concept') is widely used and understood (Stebbins 1950; Cronquist 1988; Stuessy 1990; Levin 1979, 2000) and would also equate to the 'diagnostic species concept' of Judd *et al.* (2002). Characters most commonly used in the identification keys are those of inflorescence morphology, leaf lamina shape, flower morphology (particularly shape, size and indumentum cover) and fruit size and shape.

If only a single, or several minor (e.g. indumentum colour or density) character state differences are present and the discontinuity is geographically based, the rank of subspecies is used. It is generally considered that subspecies should differ in only a few minor characters and that intermediate populations should exist to demonstrate continuity of character states (e.g. Stebbins (1950) states "subspecies....connected....by a series of intergrading forms" or Stace (1989) states "a population of several biotypes forming a more or less distinct regional facies of a species.....a geographical race, ecotype, topodeme or genoecodeme"). In this revision subspecies are recognised within *Tarenna dallachiana* due to the existence of intermediate forms.

Taxonomy

Tribe ***Pavetteae*** A. Rich. ex Dumort., *Anal. Fam. Pl.* 33 (1829); Bridson & Robbrecht, *Bull. Nat. Plantentuin Belg.* 55: 83–115 (1985); Andreasen & Bremer, *Amer. J. Bot.* 87: 1743 (2000).

Shrubs, small trees or lianas; stipules interpetiolar, entire; leaves entire, without raphides; inflorescences terminal on main or lateral branches, rarely pseudo-axillary, trichotomously branched. Flowers 4 or 5-merous; corolla lobes contorted to the left; corolla tubes long and slender tubes (usually much longer than its lobes), anthers affixed at throat and exserted; stylar pollen presentation present; pollen grains 3–4(–5) colporate; style exserted or rarely included in the corolla tube, the stigmas fusiform, clavate, not lobed; ovary 2-locular, axile placentation with 1-many ovules, the ovules either attached to the central septum, or embedded on a fleshy placenta which is

attached to the dissepiment usually near the middle. Fruits fleshy, 1-many seeded; seeds either 4-many in each cell of the fruit, then very small, angular and reticulate, or seeds solitary or 2 in each cell of the fruit, then large ± hemispherical, rounded dorsally, and with an adaxial excavation on the ventral side.

***Distribution*:** Mainly Paleotropical. About six genera, three (one new) in Australia.

Key to the Australian genera of *Pavetteae*

1. Stipules connate to above its middle into an oblique sheath; inflorescences terminal on main and lateral branches; bracts at base of trichotomous inflorescence branches connate, membranous; ovules and seeds one in each cell of the ovary or fruit; fruits without a thin crustaceous shiny endocarp ..... **Pavetta**

   Stipules slightly united at base only; inflorescences terminal on main branches; bracts at base of trichotomous inflorescence branches free or connate towards their base; ovules an seeds 1-many in each cell of the ovary or fruit; fruits with a thin crustaceous shiny endocarp 2

2. Inflorescence branches terminated by 3-flowered dichasial cymes; bracts at base of the trichotomous branches of the inflorescence shortly connate; bracteoles paired, one on each side of the calyx; flowers 4 or 5-merous; seeds 2 in each locule of the fruit, rounded on top, angular on its sides; stipules usually obtuse ..... **Triflorensia**

   Inflorescences branches not terminated by 3-flowered dichasial cymes; bracts at base of inflorescence branches free; bracteoles 3 or 4, alternate on the pedicel (one on calyx); flowers 5-merous; seeds either small and 4-many in each locule of the fruit (if so, then angular, reticulate (like orange segments)), or large and solitary in each cell of the fruit (if so, thensubglobose, rounded on top and with a thick rimmed circular excavation on its ventral side); stipules acuminate ..... **Tarenna**

Tarenna Gaertn., *Fruct. Sem.* 1: 139, t. 28 (1788). **Type:** *T. asiatica* (L.) Kuntze ex K.Schum. (based on *Rondeletia asiatica* L.; syn. *T. zeylanica* Gaertn.)

Chomelia L., *Opera Varia* 210 (1758) *nom. rej.*

[*Webera* auct., non Schreber: Bentham, *Fl. Austral.* 3: 412 (1867); F.M.Bailey, *Queensland Fl.* 3: 752 (1900)].

[*Stylocoryne* auct., non Cav.: Domin, *Biblioth. Bot.* 617 (1929)]

Shrubs or small trees; branchlets terete or 4-angled towards their tips. Leaves petiolate, often blackish when dry; stipules persistent, erect, free or connate towards base, ovate or triangular-ovate, sometimes articulated towards base, acuminate or aristate at apex, usually with a darker central area and paler margins, provided with a prominently bifid keel (the keel bifid towards base) and with collectors towards its base inside. Inflorescences terminal, many-flowered, corymbiform panicles, trichotomously branched, the three branches clustered on a short peduncle or clustered at apex of the branchlet subtended by the uppermost pair of leaves; lowermost branches usually patent; ultimate cymules 2–5-flowered; bracts free or slightly connate (towards the base), and with very narrowly lanceolate lateral lobes. Flowers bisexual, 5 (rarely 4)-merous, fragrant; pedicellate; bracteoles small, alternate on the pedicels, subulate or ovate. Calyx tube subcyathiform or cupular; limb wider and thinner, 5 (rarely 4)-lobed at apex, with lobes imbricate, ovate or hemispherical. Corolla white;

tube infundibuliform or cylindrical and usually dilated towards apex, longer or shorter than the lobes, usually hairy at throat; corolla lobes 5 (rarely 4), twisted to the left in bud, ± oblong, patent or reflexed, hairy inside. Stamens 5 (rarely 4), inserted at throat (slightly below the orifice of corolla tube); anthers long, narrowly ovoid, with a prolonged ovate connective at apex, slightly sagittate at base, dorsifixed; filaments much shorter, glabrous. Disc fleshy, annular. Ovary 2-locular; ovules 1-many per locule, ovoid, attached to septum or impressed on the semicircular placenta which is attached to the septum; style (with stigma) shortly exceeding the corolla tube or long exserted; style filiform, hairy towards middle or glabrous; stigma long, fusiform or clavate, with lobes coherent for most of stylar length or stigma bifid at apex. Fruits shiny, usually blackish when ripe, subglobose, crowned by persistent calyx, 2-locular; seeds 1-many per locule, if many they are blackish, angular, rugulose and closely reticulate resembling orange segments, or if solitary, subglobose, smooth or finely reticulate on top, and with a circular excavation (hilar cavity) on their ventral side; pericarp smooth outside; endocarp thin, crustaceous, very shiny and brown.

Tarenna has *c.* 370 species (Wong 1989; Ridsdale 1998) in tropical Africa, Asia, Pacific Islands, New Guinea and Australia (three species).

***Etymology*:** The name *Tarenna* is derived from *"Tarana"* a Sri Lankan plant name.

***Diagnostic features*:** The genus *Tarenna* (in Australia) is characterised by its terminal, trichotomous corymbiform panicles, (4-) 5-merous flowers, styles with fusiform stigmas, small, globose, 1-many seeded fruits with a thin, shiny, crustaceous endocarp, usually blackish discoloration of its leaves and inflorescences, 4-angular young branchlets, and triangular acuminate stipules with softer paler margins and a bifid keel. *Tarenna* may be distinguished from other members of the tribe *Pavetteae* in Australia, *viz*. *Pavetta* and *Triflorensia* as indicated above.

Infrageneric Classification

Three subgenera are recognised under *Tarenna* here: two of these were previously recognised as sections by Hooker (1882: 104) and Valeton (1924: 84). Only the subgenera *Pseudoixora* and *Pacifica* occur in Australia.

Key to subgenera

1. Ovules solitary in each cell of the ovary, attached to the septum; seeds solitary in each cell of the fruit, large, smooth, subglobose, with a thick-rimmed circular excavation on its ventral side ..... **3. Pseudoixora**
   Ovules 4-many in each cell of the ovary, impressed on the suborbicular placenta which is attached to the septum; seeds 4-many per fruit, small, angular, densely reticulate, resembling orange segments 2

2. Branchlets usually stout, 4-angular towards their apices; stipules large, triangular, acuminate or aristate at apex, darker in the centre and with paler soft margins; inflorescences large, many-flowered; calyx lobes ± hemispherical or ovate; corolla tube long and slender, usually much longer than its lobes; style usually much exserted from the corolla tube ..... **2. Pacifica**
   Branchlets usually slender, terete or ± 4-angular towards their apices; stipules ovate, cuspidate at apex, coriaceous; inflorescences smaller, loosely branched and flowered; calyx lobes ovate; corolla tube usually as long as its lobes; style usually slightly exserted from the corolla tube ..... **1. Tarenna**

1. Tarenna subgenus **Tarenna**

Type: *Tarenna asiatica* (L.) Kuntze ex K.Schum. (syn. *T. zeylanica* Gaertn.).

Webera sect. *Webera* Hook f., *Fl. Brit. India* 3: 104 (1882). **Type:** not designated.

Distinguishing characters as indicated in the key above.

***Distribution*:** Mainland Asia (China, Indian subcontinent) and south-east Asia (Wong 1989; Ridsdale 1998).

***Notes*:** *Tarenna appressa* (King) Corner from India and *T. lanceolata* Chun & How ex W.C.Chen from China also belong to this subgenus (*fide* specimens at K, L).

2. Tarenna subgenus **Pacifica** S.T.Reynolds **subgenus nova** quoad placentam et semina *Tarennae* subg. *Tarennae* similis autem inflorescentiis grandioribus multifloris, tubis corollae lobis multo longioribus, lobis calycem hemisphericalis, stipulis magnis triangularis marginibus pallentioribus, mollioribusque praeditis, ramulis 4-angularibus differt. **Typus:** *Tarenna sambucina* (Forst.f.) Durand ex Drake (syn. *Coffea sambucina* Forst.f.).

Tarenna sect. *Multiovulatae* Valeton in Lauterbach, *Beitr. Fl. Papuasien 13*, *Bot. Jahrb.* 60: 84 (1924). **Type:** *Tarenna sambucina* (Forst.f.) Durand ex Drake

Trees or shrubs with stout, 4-angular branchlets; large broad triangular stipules which are acuminate or aristate at apex, and usually provided with a thicker darker area in the centre and softer paler edges. Inflorescences large, usually many-flowered; flowers with long, slender corolla tubes which are usually much longer than its lobes; usually ± hemispherical calyx lobes; long styles which are usually much exserted from the corolla tube; fusiform stigmas; ovary with 4-many ovoid ovules which are impressed on the fleshy placentas; 4-many-seeded fruits with small, angular reticulate seeds.

***Notes*:** *Tarenna* subgenus *Pacifica* has the ovules, placenta and seeds of *Tarenna* subgenus *Tarenna*, but differs from it by its stout 4-angular branchlets, the large triangular stipules, large many-flowered inflorescences, and long narrow corolla tubes which are usually much longer than its lobes (see key to subgenera).

Two Australian species, *viz. Tarenna dallachiana* (F.Muell. ex Benth.) S.Moore and *T. monticola* S.T.Reynolds & P.I.Forst. are referrable to this subgenus.

***Distribution*:** Australia, New Guinea and islands of the Pacific and Indian oceans. Two species occur in Australia (*T. dallachiana* and *T. monticola*), one species in the Pacific Ocean (*T. sambucina*), one species in New Guinea (*T. barbellata* Valeton) and one species from the Indian Ocean (*T. buruensis* Merrill).

***Etymology*:** The name of the subgenus alludes to the Pacific Region where the species referrable to this subgenus are commonly found.

Key to the Australian species of *Tarenna* subgenus *Pacifica*

Corolla hairy outside, tube 8–22 mm long, lobes erect; seeds 4–16 per fruit, very rarely more; domatia in angle between lateral veins and midrib absent below; leaf apex obtuse, subacute or shortly acuminate . . . . . **1. T. dallachiana**

Corolla glabrous outside (rarely subglabrous), tube 4–7 mm long, lobes mostly recurved; seeds 14–26 per fruit; tufts of hair in angle between lateral veins and midrib present below; leaf apex mostly long acuminate . . **2. T. monticola**

1. Tarenna dallachiana (F.Muell. ex Benth.) S.Moore, *J. Bot.* 64: 94 (1926). *Webera dallachiana* F.Muell. ex Benth., *Fl. Austral.* 3: 412 (1867); *Ixora dallachiana* (F.Muell. ex Benth.) F.Muell., *Syst. Census Australian Plants* 1: 75 (1882); *Chomelia dallachiana* (F.Muell. ex Benth.) O.Ktze, *Rev. Gen. Pl.* 1: 278 (1891); *Stylocoryna dallachiana* (F.Muell.) Domin, *Biblioth. Bot.* 89: 617 (1929). **Type:** Queensland. Cook District: Albany Island, date unknown, *W.Hill s.n.* (lecto [here designated]: K; photo BRI).

Small trees 2–8 m high, bark grey or mottled grey and white, smooth or tessellated; young branchlets and leaves finely hairy to glabrous; branchlets and petioles sometimes scurfy. Leaves petiolate; lamina elliptic, ovate-elliptic, broadly elliptic or elliptic-oblong, apex abruptly shortly acuminate, subacute or obtuse, base obtuse or subacute and attenuate into petiole, (12–) 14–25 (–27.5) × (3.7–) 5.5–9 (–13) cm, coriaceous, dries blackish or brownish, greenish or greenish brown and sometimes slightly glossy above; upper surface glabrous or hairy on the main nerves; lower surface usually pubescent with usually fine hairs all over (especially young leaves), or hairy only on the main nerves; lateral nerves 8–14 pairs, suboblique or patent, mostly arched at their tips; petioles (1–) 2–3.5 (–5) cm long, sparsely hairy or glabrous. Stipules 6.5–11 × 3–6 mm, triangular or ovate, gradually narrowing at apex to a subulate acumen or cuspidate, usually with a darker centre and paler softer margins, puberulent or glabrous, sometimes slightly viscid, usually with thick, viscid colleters at base inside. Inflorescences usually densely flowered (38–152-flowered); the 3 branches subtended by the uppermost pair of leaves of the branchlets; peduncles sparsely short hairy; central branch with 1 or 2 internodes (these 1–2.2 cm long); lateral ones 2–9 cm long, 12–152-flowered; ultimate branches 1–1.7 cm long, terminated by 2 or 3-flowered cymules or 9–24-flowered cymes; bracts subtending the inflorescence stipular, ovate, those at junction of the upper branches subulate; bracteoles 2–4, alternate on the pedicel, minute (about 1.5 mm long), narrowly ovate or subulate, ciliolate. Flowers perfumed; pedicels 2–9 mm long. Calyx 1.5–2.5 × 1–2 mm; tube glabrous or puberulous, dries blackish; limb paler, indistinctly toothed; calyx lobes small, 0.25–0.5 mm long, ± hemispherical, obtuse, truncate or retuse at apex, ciliolate. Corolla tube cylindrical, gradually dilated from base to the mouth or dilated near mouth only, (8–) 12–22 mm long, 1–3 mm wide at mouth, 0.7–1.5 mm wide at base, straight or slightly curved, densely appressed hairy outside, sparsely appressed hairy inside; corolla lobes usually erect, elliptic, oblong obovate or subobovate, 3.5–6.5 × 1.5–3 mm, retuse or obtuse; disc glabrous. Stamens exserted; filaments 1–1.8 mm long; anthers 3.5–6.5 mm long. Styles 2.3–4.5 mm long, exserted (exserted portion (from corolla tube) 1–1.8 cm long), hairy towards the middle (from below stigma); ovary 2 locular; ovules (2–) 4–8 in each loculus, ovoid, impressed on the ± ovoid fleshy placenta which is attached to the septum. Fruits globose, topped by remnant calyx rim, dull olive, black when ripe, 6.5–8 × 6–8 mm; seeds (4–) 8–16 per fruit, small, *c.* 1 × 2 mm, angular, reticulate, black; fruit stalk 8–12 mm long.

***Typification*:** Two syntypes were originally cited by Bentham (*viz.* Rockingham Bay, *Dallachy s.n.* (syn: MEL) and Albany Island, *Hill s.n.* (syn: K). The Hill collection is the better of the two and is selected here as lectotype for the name.

***Notes*:** *Tarenna dallachiana* is readily distinguishable by its usually large, glabrous or finely hairy, elliptic leaves which dry greenish, greenish-brown or blackish, large triangular stipules with soft edges and a bifid keel, 4-angular, darkish, usually scurfy young branchlets, many-flowered corymbiform inflorescences, ± hemispherical ciliolate calyx lobes, long corolla tube (tube dilated near apex or gradually tapering from mouth to base) which are appressed hairy outside, short, oblong corolla lobes, subsessile anthers which are nearly as long as the corolla lobes, and 4–14 seeded fruits.

The shape and size of leaves, the colour of dried leaves, the presence or absence of hairs on young branches and young leaves, and the length and shape of corolla tube are all very variable in the specimens available for study of this species. Two subspecies are recognised here that merge into each other at the outer parts of their respective ranges on Cape York Peninsula.

***Etymology*:** The specific epithet honours the botanical collector John Dallachy (1808-1871) who collected many specimens for Ferdinand Mueller.

Key to subspecies of *Tarenna dallachiana*

1. Corolla tube 8–12 long, usually gradually dilated towards its mouth (2–3 mm wide at mouth); pedicels 2–5 mm long; seeds 4–8(–12) in each fruit; leaves 12–25 (–27.5) × 3.7–9.0 (–10.7) cm, dries blackish or dark brown, both surfaces glabrous or lower surface sparsely hairy on the main nerves; young branchlets and young leaves sparsely hairy or glabrous . . . . . **1a. Tarenna dallachiana** subsp. **dallachiana**

   Corolla tube 14–22 mm long, cylindrical, usually dilated only towards its throat (1–2.5 mm wide at mouth); pedicels (2–) 4–9 mm long; seeds (6–(6–) 8–12 (–16) in each fruit; leaves (10–) 15–22 (–24) × (3–) 6–9.5 (–13) cm, dries greenish or pale brown; upper surface glabrous or subglabrous, lower ones covered with soft hairs, or occasionally only the main nerves hairy; young branchlets and young leaves densely hairy with fine soft hairs (usually velvety) . . . . . **1b. Tarenna dallachiana** subsp. **expandens**

1a. Tarenna dallachiana subsp. **dallachiana**

Distinguishing characters as indicated in the key above.

***Illustrations*:** Hyland *et al.* (1999, 2003); Cooper & Cooper (2004).

***Selected specimens examined*: Queensland.** Cook District: Upper Parrot Creek, Annan River, 15° 48'S, 145° 15'E, Sep 1948, *Brass 20293* (BRI); Mt Amos, Cooktown, 15° 42'S, 145° 18'E, Nov 1986, *Burkitt 61* (BRI); Fly Point, about 2 km SE of Somerset, 10° 45'S, 142° 36'E, Jul 1992, *Clarkson 9646 & Neldner* (BRI); Jardine River National Park, 11° 20'S, 142° 45'E, Aug 1987, *Fell DGF587* (BRI); Rex Range, Little Mossman S.F. 141, 16° 32'S, 145° 23'E, Jan 1993, *Forster PIF13071 & Bean* (BRI, QRS); Home Rule, 3 km E of Rossville, 15° 45'S, 145° 17'E, Apr 1999, *Forster PIF24247 & Booth* (A, BISH, BRI, K, L, MEL, QRS); Freshwater F.R., Lake Morris road, 16° 56'S, 145° 42'E, May 2005, *Forster PIF30957 & Jensen* (BRI, L, MEL, MO, NSW); track to Mt Misery from Shiptons Flat, 15° 49'S, 145° 13'E, Jun 2005, *Forster PIF31010 & Jensen* (BRI, L, MEL, NSW); Claudie River, 12° 43'S, 143° 17'E, Oct 1981, *Hyland 11179* (BRI); Upper Escape River, 11° 10'S, 142° 45'E, Aug 1976, *Kanis 2079* (BRI); Endeavour River, 1883, *Persieh 25* (MEL); Between Mulgrave and Russell Rivers, 1887, *Sayer* (BRI); Lower slopes of Mt Saunders, 15° 25'S, 145° 14'E, Mar 1984, *Scarth-Johnson 1410A* (BRI); Bamaga, Oct 1965, *Smith 12395 & 12581* (BRI); Mourilyan, Feb 1923, *White* (BRI). North Kennedy District: Clump Point, Feb 1972, *Crome 263* (CANB, QRS); Rockingham Bay, *Dallachy s.n.* (MEL 1538176, NSW 19378 – residual syntypes); Strathdickie, Proserpine, *Michael 1264 & 1387* (BRI); Clump Point, Dec 1969, *Winkel s.n.* (BRI). South Kennedy District: Port Mackay, *Dietrich 375* (MEL); *loc. cit.*, 1885, *Marguart s.n.* (NSW 193797); *loc. cit.*, Oct 1882, *Griffith 93* (BRI). Port Curtis District: Byfield near Keppel Bay, Sep 1931, *White 8169* (BRI).

***Distribution and habitat*:** Eastern Queensland, chiefly coastal, from Cape York Peninsula to Keppel Bay; usually on ridges, gullies, hillsides and sometimes on river levees, mostly at the margins of rainforests (**Map 1**).

***Notes*:** *Tarenna dallachiana* subsp. *dallachiana* is characterised by the darkish discoloration of its dried leaves and branchlets, glabrous or sparsely hairy branchlets (usually with antrorse hairs) and corolla tubes which are usually dilated from base to apex. The shape and size of leaves and presence of hairs are variable in this subspecies and a few forms appear to be present.

This subspecies usually has scurfy branchlets, thickly coriaceous, large or middle-sized, slightly glossy leaves that dry blackish or brown, and flowers with wide corolla tubes. Specimens with these characteristics, especially those from around Proserpine and Mackay, resemble the syntype from Rockingham Bay.

Specimens from Cape York Peninsula show considerable variation. Some resemble the above, whereas others with larger elliptic leaves that dry brown, and with glabrous branchlets and leaves resemble the syntype from Albany Island.

Specimens from Bamaga and Rex Range differ from the above in their longer, usually larger leaves, sparsely hairy young branchlets and young leaves and approach specimens from around Weipa included under subsp. *expandens*.

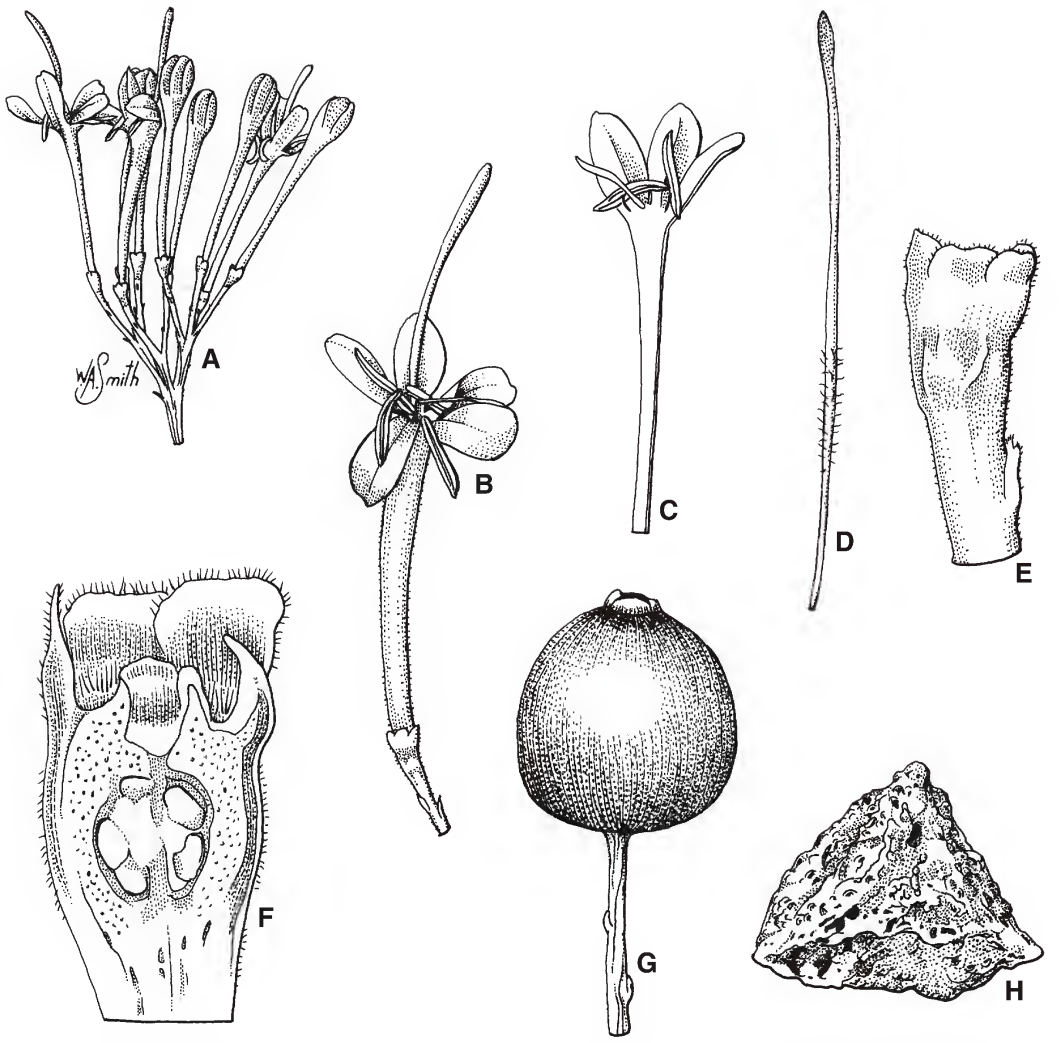


Fig. 1. ***Tarenna dallachiana*** subsp. ***expandens.*** A. branch of inflorescence ×1. B. flower ×2. C. longitudinal section of flower ×2. D. style and stigma ×2. E. calyx with bracteole ×8. F. longitudinal section of ovary showing ovules on placenta ×16. G. fruit ×4. H. seed ×12. All from *Booth R241* (BRI)). Del. W. Smith.

Specimens included here that were collected from the Annan and Claudie Rivers appear to be quite distinct. They differ from the others in their smaller usually broad elliptic leaves, glabrous leaves and branchlets and a slightly different aspect. All of these specimens seen are in fruit and their affinities are unclear at this time.

1b. Tarenna dallachiana subsp. **expandens** (F.Muell.) S.T.Reynolds & P.I.Forst. **comb. et stat. nov.**; *Webera expandens* F.Muell., *Fragm.* 6: 25 (1867); *W. dallachiana* var. *expandens* (F.Muell.) F.Muell., *Fragm.* 9: 187 (1875); *Ixora expandens* (F.Muell.) F.Muell., *Syst. Census of Australian Plants* 1:74 (1882); *Tarenna expandens* (F.Muell.) S.Moore, *J. Bot.* 64: 94 (1926). **Type**: Northern Territory. Adam's Bay, date unknown, *Hulls s.n.* (holo: MEL 1533300 [flowering specimen]).

Tarenna foliosa S.Moore, *J. Bot.* 64: 94 (1926). **Type:** Northern Territory. Groote Eylandt, Feb 1925, *S. Moore 116* (holo: BM [flowering specimen], **syn. nov.**

Distinguishing characters as given in the key above. **Fig. 1.**

***Selected specimens examined*: Western Australia.** 11 km N of King Cascade, 15° 31'S, 125° 19'E, Jun 1987, *Kenneally 10556 & Hyland* (BRI, PERTH). **Northern Territory.** Goromuru River floodplain, 12° 37'S, 136° 14'E, May 1992, *Cowie 2843* (BRI, DNA); Magela Creek upper Catchment, 12° 49'S, 133° 00'E, Apr 1995, *Cowie 5659 & Brennan* (DNA); Daly River, 13° 42'S, 130° 33'E, Sep 1975, *Dunlop* 3595 (DNA); Garden Point, Melville Island, Sep 1977, *Dunlop 4622* (BRI, CANB, DNA); Arnhem Land, Mt Permain, 11° 56'S, 132° 58'E, Oct 1987, *Dunlop 7023* (BRI, DNA); Upper Goomadeer River, 12° 40'S, 133° 34'E, Oct 1987, *Dunlop 7227 & Munns* (BRI); 5 km SE Lake Eames, Vanderlin Island, 15° 42'S, 137° 04'E, Aug 1988, *Latz 11079* (BRI); Headwater Springs, Green Ant Creek, 13° 30'S, 131° 14'E, Mar 1989, *Leach 2547 & Dunlop* (BRI); Melville Island, Yapilika tributary of Maxwell Creek, 11° 33'S, 130° 35'E, Jan 1992, *Leach 2952 & Cowie* (BRI, DNA); Little Angurugu River, Groote Eylandt, Sep 1973, *Levitt 353* (DNA); Nourlangie Rock area, 12° 57'S, 132° 50'E, Nov 1972, *McKean B774* (DNA); Darwin, Feb 1961, *McKee 8263* (BRI, MEL, NSW); Hapgood River, Gapuwuyak, 12° 37'S, 135° 50'E, Sep 1987, *Russell-Smith 3432 & Lucas* (BRI, DNA); Bathurst Island, Pimaroo Creek, 11° 23'S, 130° 22'E, Jun 1988, *Russell-Smith 5783 & Lucas* (BRI, DNA); 19 km E Jabiru, 12° 37'S, 133° 03'E, Apr 1989, *Russell-Smith 8020* (DNA); Mt Brockman, Kakadu National Park, 12° 50'S, 132° 54'E, Apr 1989, *Russell-Smith 8063 & Lucas* (BRI, DNA); Adelaide River crossing, Daly River road, 13° 30'S, 131° 04'E, Dec 1990, *Russell-Smith 8372 & Lucas* (BRI, CANB, DNA, K, MEL). **Queensland.** Cook District: 30.9 km from the beach at Ussher Point on the track to the main Peninsula road, 11° 05'S, 142° 35'E, Jul 1992, *Clarkson 9689 & Neldner* (BRI); Weipa Concession, N bank of Mission River, Sep 1974, *Dockrill 882* (BRI, QRS); Andoom Bridge area, near Weipa, Jan 1989, *O'Reilly 110* (BRI); 11.5 km N of Weipa Mission, 12° 35'E, 141° 54'S, Dec 1974, *Specht & Salt W113* (BRI).

***Distribution and habitat*:** Northern tropical Australia from around Darwin to Arnhem Land in the Northern Territory and near Weipa, on Cape York Peninsula, Queensland. There is a single (sterile) collection from Western Australia in Prince Regent Nature Reserve. Plants usually grow at the edge of swamps, mangroves and semi-deciduous vine forests, near permanent water (*viz*. spring fed soakage pockets along creeks and drainage lines and creek line) on gorges and sandstone ridges, on sandy clay loam (**Map 1**).

***Notes*:** Mueller (1867) described *Tarenna expandens* (as *Webera expandens*) as a distinct species but later reduced it to a variety of *Webera dallachiana* (Mueller 1875). Infraspecific rank for *T. expandens* is maintained here, because although the types of these names are quite different they are connected by intermediate forms, particularly on northern Cape York Peninsula. Recent checklists of the Northern Territory flora have listed this subspecies as simply *T. dallachiana* (Dunlop 1987; Liddle *et al.* 1994).

Tarenna dallachiana subsp. *expandens* is characterised and distinguished from *T. dallachiana* subsp. *dallachiana* by hairy branchlets and leaves (especially velvety young leaves), usually greenish or greenish brown colour of dried leaves (the green colour usually persisting in the herbarium for a very long time), flowers with long very slender corolla tubes and long pedicels. This subspecies varies greatly in the shape and size of leaves and inflorescences, hairiness of leaves and branchlets, colour of dried leaves, and the number of nerves.

Several forms are distinguishable in the specimens available for study. The typical form is represented by specimens from around Darwin and Melville Island. They resemble the type specimen of *T. expandens* in their short, broadly elliptic or elliptic-oblong leaves which are usually broad and obtuse at the base, finely hairy on their lower surface and usually dry greenish or greenish brown.

Specimens from eastern Arnhem Land and the islands of the Gulf of Carpentaria are variable in their leaves. Some of these with larger, hairier leaves resemble the type of *T. foliosa* (this species now combined under this subspecies), whereas those with relatively narrower leaves are not unlike those from northern Queensland (*viz*. Bamaga, Rex Range), except that their young leaves are velvety, lateral nerves more oblique, and their petioles longer.

The following collections *viz*. *Dunlop 3595* from Mt Permain, Arnhem Land, *Russell-Smith 8020* from East Jabiru, *Dunlop 7227 & Munns* from Upper Goomadeer River, and *McKean B774* from Nourlangie Rock probably represent a distinct form but specimens are inadequate to ascertain this at the present. The specimens differ from the other collections of

this variety in their hairier, usually smaller, elliptic leaves (10–17 (–19) × 3–4.4 (–7) cm), which are usually narrow at both ends (mostly acuminate or acute at apex, acuminate and decurrent into a long petiole at base); comparatively greater number of nerves ((9–) 10–14 pairs) on each leaf, usually very oblique nerves; longer petioles (1.5–5 cm long), and 8–16-seeded fruits.

***Conservation status*:** *Tarenna dallachiana* subsp. *expandens* is widespread and not threatened. It is present in Kakadu National Park in the Northern Territory and Prince Regent Nature Reserve in Western Australia.

***Etymology*:** The subspecific epithet is derived from the Latin word *expansus* (expanding), but the application is obscure.

2. Tarenna monticola S.T.Reynolds & P.I.Forst. **sp. nov**. a *T. dallachianae* (F.Muell. ex Benth.) S.Moore floribus pedicellisque brevioribus, corollis glabris, fructibus 14-26-seminalis, foliis apice acuminatis domatiis prominentibus pubescentibus differt. **Typus:** Queensland. Cook District: Riflemead Forest Reserve, 2.2 km along Mt Lewis road from Bushy Creek bridge, 16° 34'S, 145° 18'E, 5 December 2002, *A. Ford AF3781 & J. Holmes* (holo: BRI [2 sheets + spirit]; iso: QRS [1 sheet + spirit]; K, L, NSW to be distributed).

Tarenna sp. (Mt Lewis B.P.Hyland 3403) (Reynolds 1997: 184; Forster & Halford 2002: 177)

Small slender trees to 16 m; young parts especially young leaves densely finely hairy; branchlets with fine appressed hairs at their tips only. Leaves petiolate; lamina elliptic, abruptly narrowing at both ends, apex usually long-acuminate at apex, base acute or acuminate and decurrent into the petiole, 11.5–19.5 (–22) × 5–8.5 cm, thinly coriaceous, dries greenish, greyish or darkish brown with whitish or reddish nerves; upper surface dullish, glabrous, lower surface sparsely appressed hairy on the midrib and usually with prominent domatia in the axils of the main nerves; midrib sunken above; lateral nerves 8–11 pairs, suboblique and ascending at their tips; petioles 1–3 cm long. Stipules deltoid, long acuminate or aristate at apex and thinner at margins, 8–9 × 4.5–5 mm, appressed hairy outside, sometimes viscid inside. Inflorescences trichotomously branched, densely flowered; peduncles with short patent hairs; lowermost branch (lateral) 1.8–3 cm long, 29–64-flowered; bracts lanceolate or very narrowly ovate; bracteoles 2 or 3 per pedicel (one at base of calyx), narrowly ovate or slightly subulate, usually ciliolate. Flowers glabrous; pedicels (1–) 2–5 mm long, puberulous. Calyx 2.5–3.5 × *c.* 2 mm, glabrous or lobes sometimes subglabrous; calyx lobes prominent, ovate, obtuse, 0.8–1 × 0.5–0.8 mm. Corolla 8–12.5 mm long, glabrous or rarely subglabrous outside, sparsely appressed hairy inside; corolla tube 4–7 mm long, dilated gradually to mouth, 1.5–2.5 mm wide at mouth, *c.* 1.5 mm wide at base; corolla lobes 2.5–4 × *c.* 2 mm, oblong, obtuse, reflexed. Stamens exserted with filaments to 1.5 mm long and anthers 3.5–5 mm long. Style and stigma 15–20 mm long, exserted, with exserted part (from mouth of corolla tube) 6–10 mm long; style sparsely long hairy in the upper half; stigma fusiform *c.* 2 mm long; ovules 7–13 in each loculus of the ovary, impressed on the fleshy placenta which is attached to the septum. Fruits 4–5 × 5–6 mm, subglobose, (14–) 20–26-seeded; seeds very small, angular, reticulate; fruit stalk 4–7 mm long. **Fig. 2.**

***Selected specimens examined*: Queensland.** Cook District: Copper Lode Falls Dam area Cairns, Dec 1972, *Birch 93* (BRI); T.R. 66, 5.5 km along Mt Lewis road, 16° 35'S, 145° 18'E, Nov 1998, *Forster PIF23995 et al.* (BRI); Mt Misery road, East Normanby River, 15° 52'S, 145° 12'E, Nov 2000, *Forster PIF26485 et al.* (A, BRI, MEL, NSW); S.F.R. 143, Windmill L.A., 16° 33'S, 145° 15'E, Nov 1978, *Gray 1067* (BRI, QRS); [S.]F.R. 1073, 16° 45'S, 145° 30'E, Dec 1961, *Hyland 2208* (BRI); Mt Lewis, T.R. 130, Leichhardt L.A., c. 40 miles (64 km) W of Cairns, Dec 1964, *Hyland 3403* (BRI); Kuranda, 16° 49'S, 145° 38'E, Jul 1959, *Jones 1286* (BRI, CANB); Clohesy River (cult. Tolga), Dec 1991, *Sankowsky 1366* (BRI); 3 miles W of Rumula, Mt Lewis range, Oct 1964, *Schodde 4144* (BRI, CANB); S.F.R. 310, Cpt. 21, 17° 15'S, 145° 40'E, Dec 1961, *von Altena 2203* (BRI). North Kennedy District: Bluewater State Forest, 55 km NW of Townsville, 19° 13'S, 146° 25'E, Nov 1991, *Bean 3798* (BISH, BRI, LAE); Mt Fox, Nov 1949, *Clemens s.n.* (BRI [AQ716419]); 18 km W of Bruce Highway, along Forestry road, Bluewater Creek, S.F., Paluma Range, 19° 14'S, 146° 25'E, Nov 1991, *Halford Q681* (BISH, BRI, K, L, MEL, QRS).

Fig. 2. ***Tarenna monticola***. A. flowering branch ×0.5. B. branch of inflorescence in detail ×2. C. flower ×4. D. longitudinal section of flower ×4. E. style and stigma ×4. F. anther ×8. G. calyx tube with bracteoles ×8. H. longitudinal section of ovary showing ovules on placenta ×16. I. stipule ×4. A from *Sankowsky s.n.* (BRI[AQ565519]); B-I from *Halford Q681* (BRI). Del. W. Smith.

***Distribution and habitat*:** Northeast Queensland from Windsor Tableland in the north to the Paluma Range in the south. Plants grow in rainforests (complex notophyll vineforest), usually at high altitudes (480–880 m altitude) on substrates derived from basalt and metamorphics (**Map 2**).

***Notes*:** *Tarenna monticola* is readily recognisable from the other two species enumerated here, by the small domatia in the angle between the main lateral veins and the midrib on the lower surface of its leaves, coarser nerves, usually acuminate leaf apex, glabrous inflorescences, short pedicels, and glabrous corolla. Juvenile foliage is densely hairy, but this is not so evident in adult foliage. *Tarenna monticola* also differs from *T. dallachiana* by its narrower calyx lobes, shorter corolla, and greater number of seeds (14–26 seeds in each fruit).

***Conservation status*:** *Tarenna monticola* is widespread and not threatened. It is present in Paluma & Lake Eacham National Parks and a number of Forest Reserves and State Forests.

***Etymology*:** The specific epithet refers to the usual habitat of this species, from the Latin words *monti* (mountain) and *cola* (dweller).

Tarenna subgenus **Pseudoixora** (Hook.f.) S.T.Reynolds **comb. et stat. nov.**; *Webera* sect. *Pseudoixora* ('*pseudixora*') Hook.f., *Fl. Brit. India* 3: 104 (1882). **Type:** not designated.

Tarenna sect. *Pauciovulatae* Valeton, in Lauterbach, *Beitr. Fl. von Papuasien 13, Bot. Jahrb.* 60: 85 (1924). **Type:** not designated.

***Notes*:** This subgenus differs from typical *Tarenna* by its solitary ovule or seed in each cell of the ovary and fruit, and by its large, ± smooth, subglobose *Ixora* -like seed which is dorsally rounded and provided with a thick-rimmed circular excavation on its ventral side. However, its inflorescence, subulate bracteoles on the pedicels, stipules and branchlets are similar to those of subg. *Tarenna*. Bakhuizen van den Brink Jr. (1975: 47) recognised sect. *Pseudoixora* under *Tarenna* Gaertn. but did not make a formal combination.

***Distribution*:** This subgenus is present in northern Australia (*T. pentamera*), New Guinea (e.g. *T. guelcheriana* Valeton and *T. warburgiana* Valeton), south-east Asia (e.g. *T. curtisii* F.N.Williams), Mauritius in the Indian Ocean (*T. richardii* Drake ex B.Verdcourt) and Africa (Bridson 1979).

***Etymology*:** Hooker (1882) was apparently referring to the *Ixora*-like seeds when he named this subgenus (as sect. *Pseudoixora* ('*Pseudixora*').

3. Tarenna pentamera (Benth.) S.T.Reynolds **comb. nov.**; *Ixora pentamera* Benth., *Fl. Austral.* 3: 416 (1867). **Type:** Northern Territory. Cavern [Chasm] Island, off Groote Eylandt, 14 January 1803, *R. Brown 3445* (lecto [here designated]: BM; isolecto: K, CANB, MEL).

Tarenna sp. A (Koch 1992: 929).

Shrubs or trees 2–8 m tall; bark light brown or greyish brown; branchlets greyish, ± 4-gonous towards apex, densely hairy with short spreading hairs, subglabrous or glabrous. Leaves petiolate; lamina elliptic, narrowly elliptic or elliptic-ovate, apex acute or shortly acuminate, base subacute and decurrent into the petiole, sometimes suboblique, (5.5–) 8.5–15 (–18.5) × (2–) 3–5 (–6.3) cm, coriaceous, drying greenish to darkish-brown, glossy above; upper surface glabrous or sparsely hairy, lower surface densely hairy or only the nerves finely hairy, usually with small hairy tufts in axil of the main nerves; midrib sunken above, lateral nerves 8–12 pairs, slightly oblique or ± arcuate, impressed above; petioles 1.2–3.1 cm long, slender, channelled above, finely hairy or glabrous. Stipules free or slightly connate (near base), ovate or triangular, 5.5–7 × 2.5–3 mm, keeled, aristate (especially in young plants), paler at margins, finely and sparsely appressed hairy on outside, glabrous inside; colleters present at the base inside. Inflorescences trichotomously branched corymbiform panicles 4.5–7 cm long; centre branch with (1–) 2 or 3 internodes; lateral branches 2.5–7.5 cm long, 17–22-flowered; bracts ovate, sometimes very small and only represented by thick subulate lateral lobes. Flowers perfumed; pedicels 1–4 mm long; bracteoles 1 or 2 on each pedicel,

alternate, minute, narrowly ovate or subulate. Calyx cyathiform, dilated to a broad limb, 2–2.5 mm long, densely adpressed hairy outside; tube *c.* 1 mm long and *c.* 1 mm wide at mouth, with limb about 1 mm long; lobes small, *c.* 0.5 × 0.7 mm, hemispherical. Corolla white; tube infundibuliform, 2–3.5 mm long, dilated near mouth (1.5–2 mm wide at mouth), glabrous outside, densely hairy at throat; lobes longer than tube, 4.5–6 × 1.5–2 mm, obovate, obtuse, reflexed. Stamens exserted, filaments 0.7–1 mm long, anthers as long as or longer than corolla lobes, 3.5–5 mm long, usually with a prolonged acute apical connective; ovules solitary in each cell of the ovary, attached to the septum. Style with stigma 7.5–9 mm long, stigma thick, elongate, ± clavate. Fruits purple black when ripe, subglobose, 5–6 × 5.5–6 mm, sometimes ribbed when dry, 2-seeded; seeds solitary in each locule, subglobose, rounded on top, flat below and provided with a circular thickly rimmed hilar cavity in the centre, smooth or finely and obscurely reticulate on its dorsal side. **Fig. 3.**

***Selected specimens examined*: Western Australia.** Fenelon island, 14° 08'S, 125° 42'E, Jul 1977, *Kenneally 6384* (PERTH); Lone Dingo, 14° 03'S, 125° 43'E, Jan 1982, *Kenneally 7839* (BRI, QRS, PERTH); 5.9 km E of Mt Waterloo, 15° 19'S, 125° 07'E, Jun 1987, *Kenneally 10480 & Hyland* (CANB, PERTH); Mama Falls, 5 km E of Kalumburu on edge of escarpment, 14° 18'S, 126° 41'E, Dec 1992, *Mitchell 2796B* (BRI, PERTH). Sir Graham Moore Island, 13° 56'S, 126° 33'E, Jul 1973, *Wilson 11250* (PERTH). **Northern Territory.** Popham Bay, Cobourg Peninsula, 11° 16'S, 131°50'E, Jun 1983, *Bardsley s.n.* (DNA 27284); Bickerton Island, 13° 46'S, 131° 50'E, Jun 1985, *Clark 112 & Wightman* (DNA); N Coombe Point, Mountnorris Bay, 11° 26'S, 132° 47'E, Oct 1992, *Cowie 3228* (BRI, DNA); Castlereagh Bay, Dhipirrinjura Outstation, 12° 15'S, 135° 05'E, Aug 1995, *Cowie 5978* (BRI, DNA); Crocodile Island, NW of Milingimbi, 12° 00'S, 134° 50'E, Dec 1998, *Cowie 8138 & Harwood* (BRI, DNA); Wurrmalmirr Creek, Elcho Island, 11° 58'S, 135° 37'E, Jul 1975, *Dunlop 3851* (BRI, CANB, DNA); Gunn Point, 12° 12'S, 131° 01'E, Nov 1989, *Forster PIF5926 & Russell-Smith* (BRI, DNA); 6 km S Brogden Point, Murgenella, 11° 34'S, 133° 04'E, Mar 1987, *Russell-Smith 1994 & Lucas* (CANB); 5 km south Snake Bay, Melville Island, 11° 28'S, 130° 41'E, Apr 1987, *Russell-Smith 2081 & Lucas* (BRI, DNA); Groote Eylandt, Angurugu, 13° 59'S, 136° 28'E, Jul 1987, *Russell-Smith 2873 & Lucas* (DNA); NE of Port Bradshaw, Gove, 12° 27'S, 136° 49'E, Sep 1987, *Russell-Smith 3371 & Lucas* (DNA); Melville Island, Rangani Creek, 11° 18'S, 130° 31'E, Jun 1988, *Russell-Smith 5757 & Lucas* (BRI, DNA); Conder Point, Melville Island, 11° 44'S, 131° 17'E, May 1989, *Russell-Smith 8067 & Lucas* (BRI, DNA); Gunn Point, 12° 10'S, 131° 05'E, Dec 1989, *Russell-Smith 8175 & Lucas* (BRI, DNA); Yirrkala, 12° 12'S, 136° 47'E, Aug 1948, *Specht 938* (BRI, MEL); West of mouth of West Alligator River, 12° 12'S, 132° 15'E, May 1978, *Webb & Tracey 12257* (BRI, DNA, QRS); NE Coast of Cape Van Diemen, Melville Island, 11° 10'S, 130° 22'E, May 1978, *Webb & Tracey 12478* (CANB).

***Distribution and habitat*:** Northern Australia with a chiefly coastal distribution from the Mitchell Plateau, Western Australia, to the Gulf of Carpentaria, Northern Territory and on offshore islands; usually in deciduous vine thickets on coastal dunes (**Map 2**).

***Notes*:** *Tarenna pentamera* is characterised by hairy young branchlets and leaves (especially lower surface of leaves), acute or acuminate leaf apex, subulate bracteoles on the pedicels, flowers with fairly short and wide corolla tubes which are shorter than its lobes, and by its 2-seeded fruits with a large solitary subglobose seed in each locule of the fruit. It resembles *T. asiatica* in its inflorescence, the shape of the corolla and subulate bracteoles, but differs by its solitary ovule or seed in each cell of the ovary or fruit, attachment of the ovule, and by its subglobose seed. It differs from the other Australian species of *Tarenna* by its short corollas and large subglobose solitary seed in each cell of the fruit. In the other species, the corolla tube is usually very long and much longer than its lobes, and the seeds are small and numerous (more than 4) in each cell of the fruit, angular, and densely conspicuously reticulate.

***Typification*:** Several sheets of the type collection (*Brown 3445*), are available for study, the sheet at BM which consists of both flowering and fruiting specimens is here chosen as lectotype of this species name, the isolectotype at CANB has flowers only, whereas the isolectotypes at K and MEL are fruit only. Two labels are present on the BM sheet, one bears the following annotation, presumably made by Brown, "Cavern Island and island 91(?), island 3 (?), No 17 spec.", whereas the other is typed "Cavern Island and other islands near Groote Eylandt, 14 January 1803". In his manuscript, Brown cited "Carpentaria, small island adjoining Cavern Island", date of collection 14 January 1803. According to Specht

Fig. 3. ***Tarenna pentamera.*** A. flowering branch ×1.2. B. flower ×5. C. longitudinal section of flower showing a solitary ovule and anthers ×4. D. longitudinal section of ovary showing more detail of solitary ovule. ×8. E. anther. ×8. F. style and stigma ×6. G. seed ×5. All from *Cowie 3228* (BRI). Del. W.Smith.

(1958: 2) Brown visited Chasm Island, off Groote Eylandt, on that date. Vallance (1990) stated that between the 5th and 17th of January 1803, Brown visited Chasm and Finch Island and more recently Vallance *et al.* (2001) have categorically stated that "Brown lands on Chasm Island" on 14 January 1803. Hence it seems reasonable to assume that Brown's "Cavern" island is now Chasm island (13° 40'S, 136° 35'E).

***Conservation status*:** *Tarenna pentamera* is widespread and not threatened. It has not been collected from any conservation reserves.

***Etymology*:** The specific epithet is from the Greek *pent* (five) and *merus* (parts) and alludes to the perianth parts.

Triflorensia S.T.Reynolds **genus nov.** arte affinis *Tarennae* Gaertn. a quo inflorescentia ramis florentibus quibisque trichotomo ramosis instructa in cymis dichasiali 3-flora terminentibus vel floribus (praecipue lateralibus) tribus ramis quibisque in cyma 3-flora plerumque substitutis, bracteis basi breviter connatis, bracteolis binatis, floribus plerumque 4-meris, stipulis obtusis plerumque tenuibus, ramulorum ramificatione supra-axillare differt. **Typus:** *Triflorensia australis* (Benth.) S.T.Reynolds (= *Diplospora australis* Benth.)

Shrubs or small trees; branchlets pale brown or greyish with flaky bark (young ones resinous), trichotomously branched, the central axis usually with supra-axillary branching (that is the branchlet is branched (with three branches) at some distance above the last node and not at the node itself, and often provided with a long internode between the upper trichotomous branches and last node). Leaves entire, coriaceous, drying darkish; petiolate. Stipules connate from middle down or connate only towards the base with lobes broadly ovate, obtuse or slightly rounded at apex, thin, slightly scarious at margins, keeled, occasionally provided with prominent, thick, rigid lateral awns and with colleters at base inside. Inflorescences terminal, trichotomously branched with the three branches either clustered at the apex of the branchlet or clustered on a short stalk subtended by the uppermost pair of leaves, each branch terminated by a triad (dichasial cyme); all the flowers of the triad or only the lateral ones replaced by branches each terminated by a triad; branches often branched many times, with middle branch of the main inflorescence sometimes provided with 1 or 2 internodes, and terminated by 3 branches each with a triad at its apex; lateral branches of the inflorescence patent, sometimes 3-branched at their apex, each branch terminated by a triad; bracts persistent, those subtending the inflorescence stipule-like, connate, obtuse at apex and shortly sheathing at base, those at the upper junction of the trichotomous branches shortly connate with depressed ovate, slightly scarious, erose lobes, and usually provided with long or short, thick, rigid, lateral awns; colleters present at base inside. Flowers bisexual, 4 (or 5) -merous; middle flower of the triad usually sessile, lateral flowers pedicellate; bracteoles small, paired, inserted on either side of the calyx tube, ovate, erose at margins. Calyx turbinate, with limb wider and thinner, 4 or 5-lobed; lobes imbricate, thin, hemispherical, erosed at margins and usually ciliolate. Corolla tube infundibuliform, slightly shorter than the lobes; hairy or glabrous inside; corolla lobes 4 (or 5), twisted to the left in bud, longer than the tube, oblong, obtuse at apex, hairy from about middle to the base inside, glabrous outside. Stamens 4 (or 5); anthers introrse, narrowly ovoid-ellipsoid, with a short apical lobe, thicker towards the middle (near suture of the lobes), dorsifixed; filaments very short, usually inserted below apex of the corolla tube; pollen grains 3-colporate; disc fleshy, annular. Ovules 2 in each cell of the ovary, attached to the septum; style slender, as long as corolla tube; stigma shortly exceeding the corolla tube, fleshy, lanceolate, with 2 erect lobes at apex. Fruits globose, green turning black when ripe, smooth; endocarp crustaceous, thin, shiny, pale brown; seeds two (very rarely one) per locule, hemispherical-angular, smooth and rounded on top, slightly angular on its sides, flat and with a subcircular or elliptic excavation in the centre on its ventral side.

***Distribution*:** This genus is currently endemic to Australia where it is represented by three species. It is probably also in New Caledonia as *Tarenna microcarpa* (Guillaumin) Jérémie (Jérémie 1974) from that country resembles *Triflorensia australis* in its seeds.

***Notes*:** *Triflorensia* is characterised by its three inflorescence branches which are apically clustered at the branchlet tip or on a short stalk; each branch is terminated by a three-flowered dichasium, the middle flower of the triad usually sessile, the lateral ones stalked, the lateral flowers or all three flowers usually replaced by 3 branches each, these often branching again and ultimately terminated by a triad; connate ovate bracts, which are shortly sheathing at base, and provided with long or short, rigid, lateral awns; 4 (or 5) -merous flowers; paired, small bracteoles (one on each side of the calyx); thick, lanceolate stigma usually with 2 erect lobes at apex; small, 4 (rarely 3) -seeded fruits; slightly angular seeds which are rounded on top, angular on its side, and with a subcircular excavation on its flat ventral side; obtuse thin stipules, and supra-axillary branching (that is the central branch (of the three branches of the branchlet) usually branched (with 2 lateral branches) at some distance above the last node instead of at the node itself; the distance from last node to where the upper three branches of the branchlet diverge is between 5-30 mm long).

Triflorensia differs from *Tarenna* in the 2 ovules or seeds in each cell of the ovary or fruit; hemispherical seeds which are rounded on top and angular on their sides; inflorescence branches terminated by a triad (the middle flower the oldest and usually sessile, the laterals pedicellate); connate bracts (connate near base and often provided with lateral awn-like lobes); stipules thin, usually obtuse; and the supra-axillary branching of the primary branch of the branchlet.

Earlier workers such as J.D.Hooker have indicated that *Diplospora australis* Benth. was wrongly placed in the genus *Diplospora* (he had determined the type specimen of this species at K, 'certainly not *Diplospora*'), and another worker (hand writing appears to be that of ? W. Francis from BRI) had determined the same collection as '*Stylocoryne*' (now under *Tarenna*). *Diplospora australis* and the two other Australian species remained under the name *Diplospora* (e.g. Bailey 1900; White 1926; Ross 1986) until Ali and Robbrecht (1991) tranferred them to *Tarenna* Gaertn. and made the following combinations *viz*. *Tarenna australis* (Benth.) Ali & Robbr., *Tarenna cameroni* (C.T.White) Ali & Robbr., and *Tarenna triflora* (Benth.) Ali & Robbr. *nom. illeg*. (see under *Triflorensia ixoroides*).

***Etymology*:** The name of the genus alludes to the three branches of the inflorescences, each of which are terminated by a triad, the three flowers of the triad often replaced by 3 branches each terminated by a triad.

Key to the species of *Triflorensia*

1. Inflorescences usually small, the three branches terminated by a 3-flowered dichasium, or the flowers of each triad usually replaced by three stalked triads, the flowers of these are occasionally replaced by 3 branches each terminated by a triad, the whole inflorescence ultimately (3–) 7–13(–25)-flowered, internodes rarely present in the central branch; middle flower of the triad sessile, laterals stalked; peduncles and young branchlets usually with sparse short hairs; leaves 2–4.5 (–6) × 0.6–1.8 (–2.7) cm . . . . . **3. T. ixoroides**

   Inflorescences usually larger, the three flowers of each branch of the inflorescences usually replaced by three branches each terminated by a triad, the branching often repeated many times, the main branch (central branch) of the inflorescence usually with one or two internodes, the whole inflorescence ultimately (9–) 15–53-flowered; middle flower (of the 3-flowered cyme) sessile or shortly stalked, laterals stalked; peduncles and young branchlets glabrous or sparsely hairy; leaves 5–10 (–12.5) × 1.7–4.2cm 2

2. Inflorescences 27–53-flowered, peduncles glabrous or sparsely hairy; middle flower of the 3-flowered cymes sessile; lateral flowers stalked (pedicels 1–

1.5 mm long); flowers mostly 4-merous; leaves (5–) 7–10 (–12.5) × 1.7–3.5 (–4.2) cm; petioles 5–12 mm long; fruits globose, 6–10 × 7–10 mm . . . . . **1. T. australis**

Inflorescences 9–27-flowered, peduncles glabrous; all 3 flowers of the cyme usually stalked; pedicels 2.5–3 mm long, shorter in the middle flowers; flowers mostly 5-merous; leaves 5.5–7.2 × (1.8–) 3.2–4.2 cm; petioles 10–15 mm long; fruits ellipsoid or ellipsoid ovoid, 8–9.5 × 6.5–7 mm . . . . . **2. T. cameronii**

---

1. Triflorensia australis (Benth.) S.T.Reynolds **comb. nov.**; *Diplospora australis* Benth., *Fl. Austral.* 3: 413 (1867); *Tarenna australis* (Benth.) Ali & Robbr., *Blumea* 35: 302 (1991). **Type:** Queensland, Cape York, *W. Hill 39* (lecto [here designated]: K).

***Illustrations*:** Hyland *et al.* (1999, 2003).

Small trees or shrubs 2–6 m high; branchlets pale brown or pale greyish brown; young branchlets and inflorescences sparsely hairy or glabrous. Leaves petiolate; lamina elliptic, subacute or obtuse at apex, subacute and attenuate into petiole at base, 5–10.2 (–12.5) × 1.7–3.5 (–4.2) cm, coriaceous, thickened at margins; midrib raised and deeply chanelled above; lateral nerves 5 or 6 (–8) pairs, suboblique or subpatent, looping at margins; distinct both surfaces; reticulate veins not apparent; domatia absent; petioles 5–12 mm long; stipules shortly sheathing near its base and provided with 2 lateral thick rigid awns, lobes usually thin, broadly ovate, rounded or obtuse, obscurely keeled. Inflorescences 1.5–3.5 × 1.7–2.5 cm, peduncles glabrous or subglabrous, the 3 branches usually clustered on short stout peduncles (this 3–6 mm long (10 mm long in fruit)), each branch 3–13 mm long, terminated by a 3-flowered dichasial cyme (the middle flower of the dichasium sessile, laterals stalked), all the flowers or only the lateral flowers of the triad replaced by 3-branches each terminated by a triad, the three flowers of each are again replaced by three branches each with a triad, this is repeated many times, the whole inflorescence ultimately 27–53-flowered; the central branch of each inflorescence with 1 or 2 internodes, these 5–13 mm long; lateral branches without internodes, with the lowermost branch 7–18-flowered; stalk of ultimate cymes 1–2 mm long; bract at the base of the three main branches of the inflorescence, stipular, slightly sheathing and sometimes provided with lateral rigid awns, whereas bracts on upper branches small, and usually without awns. Flowers 4-merous; central flower sessile; lateral flowers stalked (pedicels 1–1.5 mm long); bracteoles ovate, obtuse; calyx 1.5–2 × 1.5–2 mm. Calyx lobes hemispherical, *c.* 0.5 × 1 mm, erose at margins and ciliolate. Corolla infundibuliform, 5–6 mm long, white; tube 2–2.5 × 2.5 mm, hairy inside, with the hairs denser towards the mouth; lobes subpatent, 3.5–4.5 mm long, oblong, obtuse, hairy from about middle down. Anthers spreading, 3–4 mm long, dorsifixed towards the base; filaments *c.* 0.5 mm long; disc fleshy shorter than calyx limb. Style and stigma 6–7 mm long, style sparsely hairy; stigma thick, as long as the anthers, slightly exceeding the corolla tube. Fruits globose, 6–10 × 7–10 mm; stipe 4–6 mm long. **Fig. 5.**

***Selected specimens examined*: Northern Territory**. 10 miles (16 km) NE Mudginberry Homestead, 12° 36'S, 132° 52'E, Jul 1972, *Byrnes 2736* (CANB, DNA); W side of Gunn Point, Nov 1990, *Cowie 1417 & Dunlop* (BRI, DNA, NSW, QRS); East Alligator River, 10 km S of Cannon Hill Ranger Station, 12° 27'S, 132° 58'E, May 1980, *Craven 6004* (CANB, DNA); Gunn Point, 12° 12'S, 131° 00'E, Apr 1984, *Dunlop 6676* (DNA); Wessel Islands, 11° 10'S, 136° 44'E, Sep 1974, *Latz 3311* (BRI, DNA); Marchinbar Island, Wessels, 11° 23'S, 136° 35'E, Dec 1987, *Russell-Smith 4476 & Lucas* (BRI, DNA, QRS); Kakadu N.P., 4 km W of Hill 301, 12° 31'S, 132° 57'E, Jun 1988, *Russell-Smith 5682 & Lucas* (BRI, DNA); 19 km E Jabiru, 12° 37'S, 133° 03'E, Apr 1989, *Russell-Smith 8053* (BRI, DNA); 12 km E of Mudginberri Homstead, Kakadu N.P., 12° 35'S, 132° 59'E, Jan 1991, *Russell-Smith 8401 & Brock* (BRI, DNA); Kakadu National Park, Ngarradj, 12° 29'S, 132° 55'E, Jan 1992, *Russell-Smith 8569 & Lucas* (BRI). **Queensland**. Cook District: Mapoon, Jul 1901, *Bailey s.n.* (BRI [AQ124224]); Coast, Mt Bremer, 26 km NE of Bamaga, 10° 42'S, 142° 31'E, Feb 1994, *Fell DGF3932 et al.* (BRI); 102 km NW of Coen, boundary of Archer Bend N.P. and Merluna Holding, 13° 20'S, 142° 29'E, Jun 1994, *Fell DGF4420 & Buck* (BRI, DNA, QRS); 28 km along road to Leo Creek Mine, McIlwraith Range, 13° 42'S, 143° 17'E, Jun 1992, *Forster PIF10047 & Tucker* (BRI, MEL, QRS); Mary Valley Scrub, 15° 02'S, 143° 45'E, Jul 1993, *Forster PIF13443 et al.* (BRI); Bolt Head, Temple Bay, 12° 15'S, 143° 05'E, Jun 1996, *Forster PIF19392* (BRI); Kroll Creek Holding – Parish of Kesteven, 13° 43'S, 143° 14'E, Mar 1982, *Hyland*

11770 (BRI, QRS); T.R. 14, Parish of Kesteven, 13° 43'S, 143° 18'E, Apr 1993, *Hyland 14744* (BRI, QRS); Lankelly Creek road, McIlwraith Range, 13° 53'S, 143° 15'E, May 1995, *Hyland 15341* (BRI, QRS); Dauan Island, Torres Strait, 9° 25'S, 142° 32'E, Sep 1971, *Lawrie s.n.* (BRI [AQ3998]); Cape York, Oct 1849, Bot 495, *McGillivray s.n.* (K – residual syntype).

***Distribution and habitat*:** *Triflorensia australis* is endemic to tropical, northern Australia where it has been collected from Arnhem Land in the Northern Territory and Cape York Peninsula and Torres Strait in Queensland. Populations are largely coastal and occur in vinethickets, often in the lee side of foredunes or coastal cliffs. Substrates are usually derived from sandstone or laterite **(Map 3)**.

***Typification*:** A lectotype is selected for the name based on the better of the two original syntypes at K.

***Notes*:** *Triflorensia australis* is readily distinguishable from the other species by its larger leaves, and larger, usually branched inflorescences. It is also markedly allopatric in its distribution.

There is considerable variation in the leaves of the specimens available for study. Generally they are elliptic, and usually medium-sized in the majority of specimens seen (e.g. *Dunlop 6676*, *Cowie 1417 & Dunlop; Hyland 5502* and *10857* resemble the syntypes). A few specimens have very small or larger leaves but are probably the result of phenotypic variation, rather than representing distinct forms, as they are connected by intermediates throughout their range. Specimens with small or narrow leaves (*viz. Byrnes 2736* and *Tracey 14645*) resemble *T. ixoroides* in their leaves, but that species differs by its very small inflorescences, whereas specimens with slightly larger leaves (viz *Russell-Smith 5733 & Lucas*; *Russell-Smith 8569 & Lucas*), appear to have a slightly different aspect in their branching and leaves (with broader bases) and may be worthy of formal recognition.

***Conservation status*:** This species is not considered threatened. It is present in Kakadu National Park in the Northern Territory and Archer Bend National Park in Queensland.

***Etymology*:** The specific epithet is from the Latin word *australis* (southern) and pertains to the perceived unusual distribution at the time of description.

2. Triflorensia cameronii (C.T.White) S.T.Reynolds **comb. nov.**; *Diplospora cameronii* C.T.White, *J. Bot.* 64: 216-217 (1926). **Type:** Queensland. MORETON DISTRICT: Yarraman, October 1924, *M.A. Cameron Y63* (lecto [here designated]: BRI [AQ717032]).

Tarenna cameronii (C.T.White) Ali & Robbr., *Blumea* 35: 302 (1991).

***Illustrations*:** Ali & Robbrecht (1991: 282); James (1992: 504); Hauser & Blok (1998: 296).

Small trees or shrubs to 4.5 m high; branchlets pale brown with thin flaky bark; young branchlets and inflorescence axes slightly viscid, glabrous. Leaves petiolate; lamina lanceolate, elliptic or broadly elliptic, obtuse or abruptly shortly acuminate at apex, obtuse or subacute and decurrent into the petiole at the base, 5.5–7.2 (–11.5) × 2–4.2 (–6.5) cm, coriaceous, drying dark brown, very glossy above, dull and pale brown below; midrib raised above, deeply channelled; lateral nerves 6–8 (-10) pairs, subpatent, looping at margins; reticulate venation not apparent; petioles 10–15 mm long. Stipules shortly connate, with lobes obtuse, thin and colleters present inside. Inflorescences *c.* 2.2 × 2.5 cm, with the 3 branches of the inflorescence clustered on a long or short main stalk (stalk 2–7 mm long), or clustered at apex of the branchlets, each branch 5–8 (–12) mm long, terminated by a triad; the 3 flowers often replaced by 3 branches each terminated by a triad, with the whole inflorescence to 27-flowered; lateral branches (3–) 7–15-flowered; central branch of the main inflorescence with 1 or 2 internodes, 5–10 mm long and 3-branched at apex; bracts shortly connate and provided with thick lateral awns, lobes broadly ovate, obtuse, (bracts at the base of the main 3-branched inflorescence occasionally with foliaceous lateral lobes, whereas those subtending the branches have narrow, scarious lobes). Flowers mostly 5-merous, middle flower of the cyme sessile or on short stalks (pedicels to 4 mm long); lateral flowers stalked (pedicels 2.5–4 mm long); bracteoles ovate, erose, *c.* 1 × 1.5 mm. Calyx 2-3.5 × 2.5–5 mm; limb thinner, 5-lobed; lobes

hemispherical, *c.* 1 × 1.7 mm. Corolla infundibuliform, 6–7 mm long, white; tube 2–2.5 × 3.5 mm long, glabrous inside; lobes oblong, obtuse, *c.* 4 × 3 mm, densely erect hairy, especially towards their base (near mouth of the tube), glabrous on the margins. Anthers narrowly ovoid, apiculate, *c.* 4 mm long; filaments *c.* 0.5 mm long. Style with stigma *c.* 7 mm long; style glabrous; stigma fusiform, slightly 2-lobed at apex. Fruits ellipsoid or ellipsoid-ovoid, 8–9.5 × 6.5–7 mm. **Fig. 4.**

***Selected specimens examined*: Queensland.** Moreton District: Yarraman, Dec 1924, *Cameron Y63* (BRI – residual syntype); Yarraman L.A., Compartment 7, Oct 1955, *District Forester s.n.* [*Cameron*] (BRI [AQ10267]); Yarraman, [S.F.]R. 289, Oct 1955, *District Forester s.n.* [*Cameron*] (BRI [AQ411508]); *loc. cit.* , Jan 1956, *District Forester s.n.* [*Cameron*] (BRI [AQ10266]); Russel's road, near Pine Mountain, 27° 32'S, 152° 43'E, Feb 1983, *Forster PIF1528 et al.* (BRI); 1.5 km SW of Mt Berryman, 27° 44'S, 152° 19'E, Feb 1991, *Forster PIF7769 & Sharpe* (BRI, QRS); Anduramba road, Biarra Range between Strange View and Barnes Hill, 27° 11'S, 152° 06'E, May 1990, *Grimshaw PG2* (BRI); Road to Worlds End Pocket, N of Ipswich (1.5 km SE of Pine Mountain), Dec 1981, *Guymer 1628* (BRI); Sandy Creek, NW of Joalah N.P., Tamborine, 27° 48'S, 152° 56'E, Dec 1987, *Mertons s.n.* (BRI [AQ408219]). Darling Downs District: Bunya Mountains N.P., Cherry Plain to Mt Kiangarow, 26° 40'S, 151° 32'E, Jul 2001, *Forster PIF27478 & Booth* (BRI, MEL, NSW); Cawdor, near Toowoomba, Jan 1976, *Gilbert s.n.* (BRI [AQ114754]); Between Gowrie Junction and Highfields, *McKenzie s.n.* (BRI [AQ397008]); near Rogers Park, S.F. 289, Cooyar, Feb 1991, *Rider s.n.* (BRI [AQ503777]); Bunya Mountains, Dec 1883, *Scortechinii s.n.* (MEL 1583913). **New South Wales**. Lismore, Oct 1894, *collector unknown* (NSW 193805).

***Distribution and habitat*:** *Triflorensia cameronii* is endemic to south-eastern Queensland and northern New South Wales with a northern limit at Yarraman and a southern limit near Lismore. Plants occur in dry rainforest (araucarian microphyll vineforest, semi-evergreen vinethicket) on volcanic soils derived from basalt (**Map 3**).

***Typification*:** White (1926) clearly indicated that the type citation covered two specimens with the same number given for collections made on different days, *viz.* "flowering specimens Oct. 1924, fruiting specimens Dec. 1924". The flowering specimen is the better of the two specimens and is selected here as lectotype for the name.

***Notes*:** *Triflorensia cameronii* is readily recognisable from the other two species by its larger ellipsoid fruits, leaves that are elliptic or lanceolate and the inflorescences that are much branched and glabrous.

***Conservation status*:** *Triflorensia cameronii* is not considered threatened in Queensland where it is present in Bunya Mountains and Joalah National Parks and a number of State Forests. In New South Wales this species is listed as Endangered (NSW Scientific Committee 2004).

***Etymology*:** Named for McRae (Mac) Archibald Cameron (1897-1994), member of the 5th Australian Light Horse in World War 1, subsequently District Forester at Yarraman and collector of the type.

3. Triflorensia ixoroides (F.Muell.) S.T.Reynolds **comb. nov.**; *Diplospora ixoroides* F.Muell., *Fragm.* 9: 182 (1875). **Type:** Rockhampton, *s.dat.*, *Dallachy s.n.* (lecto: K; isolecto: MEL) *fide* McGillivray (1972) [as *Ixora triflora* R. Br. ex Benth. *nom illeg.*]

[*Ixora triflora* auct. non (Forst.) Seem.; Benth., *Fl. Austral.* 3: 416 (1867). pro parte (quoad specimen "East Coast, *Brown*"[1] (pro parte [specimens at K and MEL only]); Rockhampton, *Thozet*[2] (MEL); Rockhampton, *Dallachy*[2] (K, MEL); Broad Sound, *Bowman*[3] (*n.v.*)]

---

[1] This collection (East Coast, *R. Brown*) is a mixed collection of two species. The fruiting specimens (at BM, CANB) that are labelled Thirsty Sound and annotated (probably by Brown) as '*Ixora triflora*' or '*Pavetta triflora*' (BM specimen) are *Ixora queenslandica* Fosberg, whereas the flowering specimens (at K, MEL) that are annotated by Brown as '*Canthoides*' (BM specimen) are *Triflorensia ixoroides.*

[2] The flowering specimens (*viz.* Rockhampton leg. *Dallachy* (MEL), Rockhampton leg. *Thozet* (MEL), and probably Broad Sound, leg *Bowman* (see [3] below) match Bentham's description of the inflorescence and flowers which are that of *Diplospora ixoroides* F.Muell.

[3] This collection is probably referrable to *Triflorensia ixoroides* as it has been recorded from this locality.

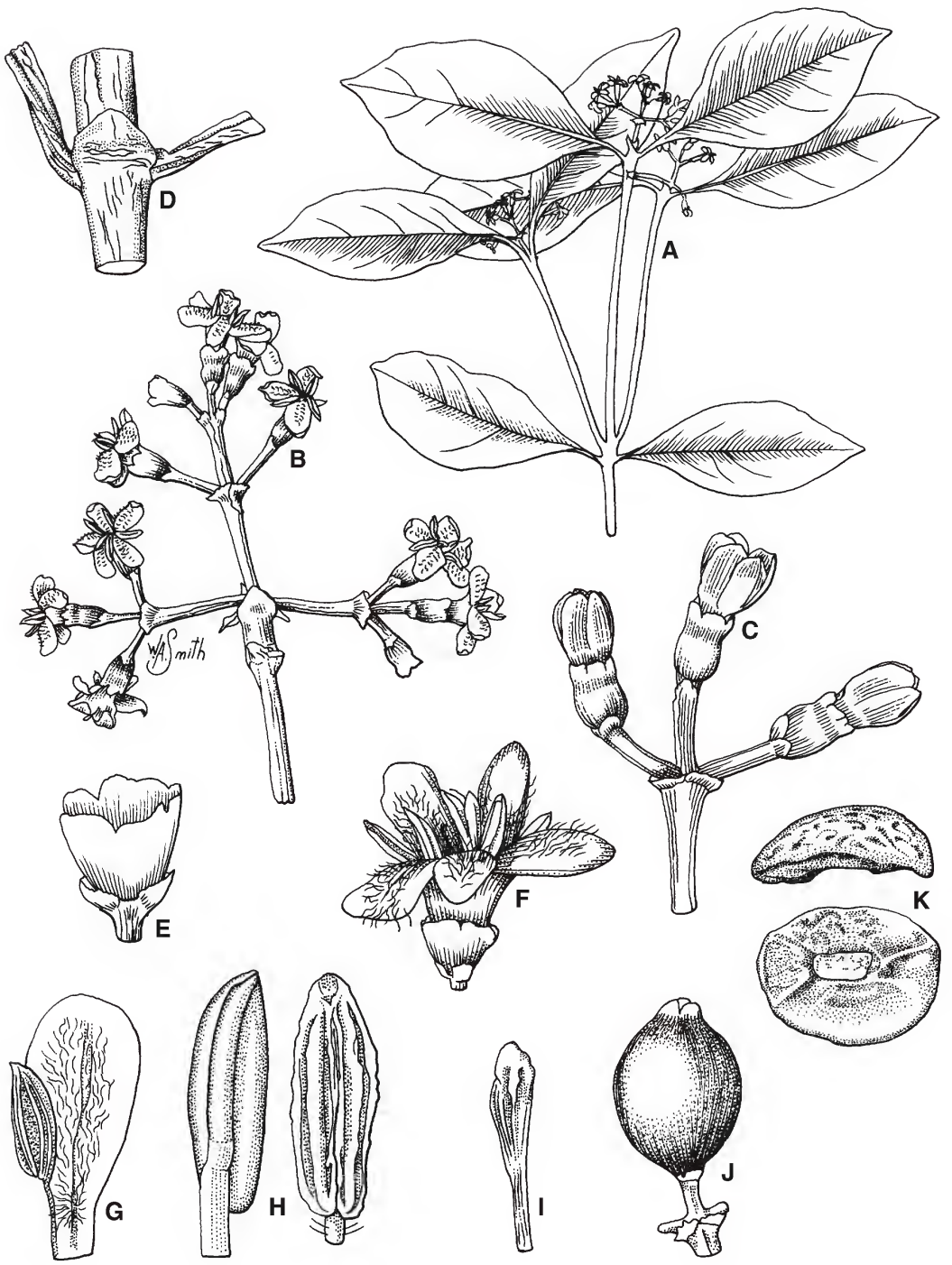


Fig. 4. ***Triflorensia cameronii.*** A. habit (flowering) ×0.5. B. detail of inflorescence showing bracts ×2. C. detail of dichasial cyme ×3. D. stipule ×3. E. calyx with bracteoles ×8. F. flower ×4. G. petal with anther ×6. H. two faces of anther ×12. I. style with stigma ×6. J. fruit ×3. K. dorsal and ventral view of seed ×6. All from *District Forester* (BRI [AQ10266]). Del. W.Smith.

Tarenna triflora (R.Br ex Benth.) Ali & Robbr., *Blumea* 35: 302 (1991) *nom. illeg.* (based on *Ixora triflora* R. Br. ex Benth. *nom. illeg.*)

Tarenna sp. (Ka Ka Mundi NP W.J. McDonald + 4642) (Reynolds 1997: 184; Forster & Halford 2002: 177)

***Illustrations*:** Jones (1986: 88); Ross (1986: 342, fig. 47M); Ali & Robbrecht (1991: 282).

Shrubs or small trees 2.5–6 m high; bark smooth or slightly rough, pale grey or grey brown; branchlets pale brown or grey, slightly 4-ridged towards their apex and sparsely minutely hairy; nodes dilated; supra-axillary branching frequent (that is the main axis of the branchlet is trichotomously branched at some distance above the last node, with the internode (between the last node and the upper trichotomous branch) usually very conspicuous. Leaves petiolate; lamina elliptic, subacute at both ends, 2–4.5 (–6) × 0.6–1.8 (–2.7) cm; margins thickened, coriaceous, dark green and very shiny on upper surface, pale green and dull below; midrib raised above and deeply channelled; lateral nerves 6 or 7 pairs, subpatent, looping at margins, not apparent on lower surface; petioles 2–4 mm long. Stipules connate towards the base, with lobes broadly ovate, obtuse; colleters present inside, prominent. Inflorescences resinous when very young, usually very small, 0.4–1 × *c.* 1.2 cm, with 3 branches clustered on a short stalk (this 2–7 mm long), or clustered at apex of the uppermost pair of leaves; peduncles finely hairy; each of the three branches of the inflorescence terminated by a triad; all three flowers or the lateral ones only are replaced by three branches each (these branches are 2–7 mm long) and terminated by a triad; flowers of each triad occasionally replaced by 3 branches each bearing a sessile flower in the centre and 2 stalked lateral branches; whole inflorescence ultimately 7–13 (–21)-flowered; central branch of the inflorescence rarely with an internode (this 2–3 mm long); bracts connate towards base, with lobes very broadly ovate, depressed on top with fimbriate margins, finely hairy at base; bracts at base of the 3-branched inflorescence (or on the top of the main peduncle) usually with thick and rigid, dark lateral awns (those subtending the upper branches are awnless). Flowers (4 or) 5-merous; middle flower sessile; lateral ones shortly stalked (pedicels 0.7–1 mm long); bracteoles ovate, erose; calyx *c.* 1.7 × 2 mm, with limb wider; lobes paler than tube, *c.* 0.5 × 1 mm. Corolla infundibuliform, 5.5–6 mm long, white; tube 2–2.5 mm long, *c.* 3 mm wide at mouth, sparsely hairy inside with long projecting hairs, glabrous outside; lobes 2.5–3.5 × 2.5–3 mm, oblong with rounded apex, recurved, densely hairy inside (from about middle down), glabrous and paler at margins. Anthers *c.* 2 mm long, ovoid, apiculate, darker along the middle (on its dorsal side); filaments *c.* 0.5 mm long; disc fleshy, annular. Style and stigma slightly protruding from the corolla tube, as long as or shorter than the anthers, style finely patent hairy; stigma fleshy, with 2 erect lobes. Fruits subglobose, 5.5-7 × 5.5–9 mm, green turning black; seeds loose in the mature fruit, subangular, minutely obscurely pitted or reticulate. **Fig. 5.**

***Selected specimens examined*: Queensland.** North Kennedy District: Mt Stuart, near Townsville, 19° 21'S 146° 47'E, Feb 1996, *Cumming 15819* (BRI). South Kennedy District: Hazlewood Gorge, 13 km SSW of Eungella, 21° 15'S, 148° 27°E, Dec 1992, *Bean 5267* (AD,BRI). Leichhardt District: Rosewood forest, Taunton National Park, 23° 31'S, 149° 13'E, Oct 1995, *Brushe 420 et al.* (BRI); Connors River, Lake Plattaway, 22° 25'S 148° 55'E, Sep 1993, *Fensham 1211* (BRI); 10 km NW of Taroom, 25° 33'S, 149° 38'E, Jan 1996, *Fensham 2864* (BRI); Anvil Peak, Hodgson Range, 22° 41'S, 148° 01'E, Aug 1990, *Forster PIF7225* (BRI, MEL, QRS); Pine Mt, S.F. 79, 21° 44'S, 148° 50'E, Apr 1991, *Forster PIF8014 & McDonald* (BRI, QRS); Expedition N.P., Amphitheatre section, Cannondale Scrub, 25° 12'S, 148° 59'E, Nov 1998, *Forster PIF23871 & Booth* (BRI, MEL, QRS); Palmgrove N.P., NW of Taroom, 25° 01'S, 149° 15'E, Nov 1998, *Forster PIF23811 & Booth* (BRI, MEL, QRS); Carnarvon N.P., northern boundary of Ka Ka Mundi section, 24° 41'S, 147° 38'E, Aug 1991, *McDonald 4642 & Bean* (BRI, CANB, NSW). Port Curtis District: "Greenfields", c. 14 km NE of Goovigen, 24° 04'S, 150° 24'E, Mar 1986, *Anderson 4113* (BRI); Western slopes of Mt McGuire, W of Gladstone, 24° 01'S, 151° 02'E, Nov 1996, *Aspland 1580* (BRI); Yeppoon Hill, Oct 1987, *Batianoff 9254 & Dillewaard* (BRI); Rockhampton, Jan 1865, *Dietrich 2301* (MEL); S.F. 583 Wietalaba, 24° 17'S, 151° 13'E, Dec 1995, *Forster PIF18268 et al.* (BRI). Burnett District: Auburn River N.P., 25° 43'S, 151° 03'E, Mar 1988, *Forster PIF3583 & Ross* (BRI, MEL); 4.5 km S of Binjour, 25° 34'S, 151° 27'E, *Forster PIF5873 et al.* (BRI, MEL). Wide Bay District: 1 km S of Booyal, 25° 13'S, 152° 02'E, Nov 1987, *Forster PIF3283* (BRI); Ashfield road, Bundaberg, 24° 52'S, 152° 24'E, Jan 1997, *Forster PIF20184* (BRI); 5 km SSW of Bauple, Dec 1982,

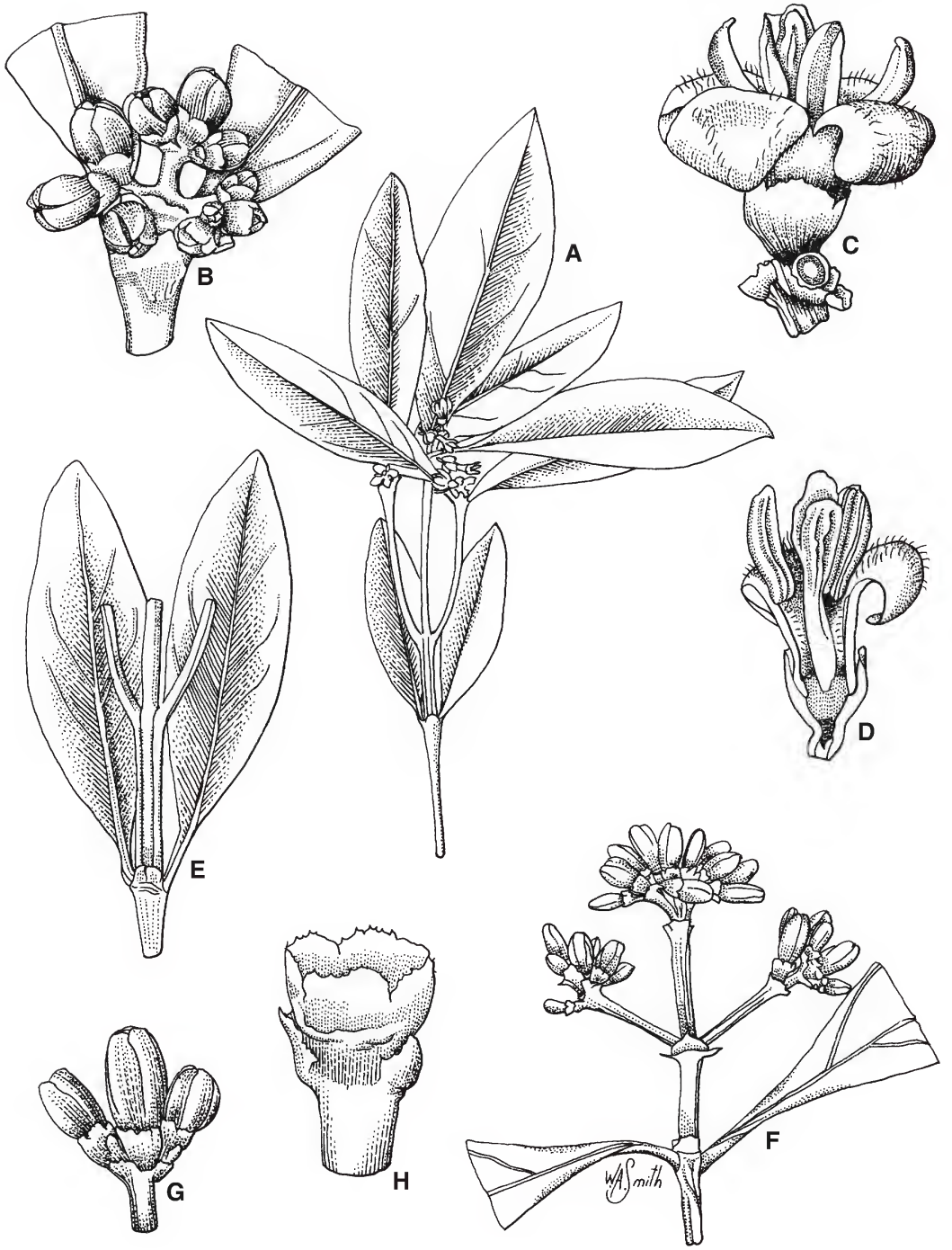


Fig. 5. ***Triflorensia ixoroides.*** A. flowering branch ×1. B. detail of inflorescence ×4. C. flower ×4. D. longitudinal section of flower ×4. E. part of branchlet showing supra-axillary branching and stipule ×2. ***Triflorensia australis.*** F. flowering branch showing stipule and bract ×2. G detail of dichasial cyme ×4. H. calyx with bracteoles ×16. A-D from *McDonald 4642* (BRI); E from *Bean 5267* (BRI); F-H from *Russell-Smith 4516* (BRI). Del. W. Smith.

Guymer 1835 & Dillewaard (BRI); S.F.38, 39 km WSW of Maryborough, 25° 38'S, 152° 19'E, Oct 1997, *Halford Q3435 & Hucks* (BRI).148° 27'E, Dec 1992, *Bean 5267* (AD, BRI).

***Distribution and habitat*:** *Triflorensia ixoroides* has a wide distribution in eastern Queensland from near Townsville to Childers, usually on ranges and slopes, in dry rainforests (araucarian microphyll vineforest, semi-evergreen vinethicket), mostly on stony soil derived from volcanic substrates (basalt, granite) (**Map 3**).

***Notes*:** *Triflorensia ixoroides* is readily distinguishable from the other two species by its small leaves and small inflorescences which are not as branched. The leaves are variable in the specimens seen in this study, they are usually small (between 3.5–4.5 × 0.8–2.4 cm) and narrowly elliptic in the majority of specimens (typical of this species), whereas a few specimens have either very small and usually very narrow leaves 2–3 × 0.6 cm (*viz. Fensham 2864* and *Beasley 102*), or largish leaves, 5–6 × 2–2.7 cm (*viz. Guymer 1835 & Dillewaard*), or occasionally both typical small leaves and largish leaves on the same branchlet (*viz. Johnson 3512 & Batianoff*).

Specimens with larger leaves may be confused with *T. australis* when sterile, but that species has a larger inflorescence and is only recorded from northern Australia.

***Typification*:** The typification and application of the names *Diplospora ixoroides* F.Muell. and *Ixora biflora* R.Br. ex Benth. is complicated and confusing due to two species being used as syntypes for the latter name and to formulate the species description (Bentham 1867) as noted by White (1926), Moore (1926) and McGillivray (1972).

Bentham's (1867) description of the fruit and seed is that of an *Ixora* whereas the description of the flowers is not that of an *Ixora* and is referrable to *Diplospora ixoroides* F.Muell. His syntypes except for Brown's collection from "East Coast"[1] (which is a mixed collection) are that of the latter species. Moore (1926) after a query from C.T. White (BRI) noted the presence of two species in the collections labelled as *I. triflora* R.Br. ex Benth. at K and that Bentham's description of the flowers was different to that of Brown's manuscript description of this species. Brown had based his manuscript description of the flowers of *Ixora triflora* from a Solander manuscript that is based on an *Ixora* flower in the Banks & Solander collection[4]. Bentham obviously did not see this manuscript. Moore (1926) lectotypified *I. triflora* R.Br. ex Benth. by selecting the BM sheet of Brown's collection from East Coast (*viz* Thirsty Sound) as lectotype. However, Fosberg (1938) noted the name *I. triflora* R. Br. ex Benth. was already an invalid name when published, being predated by *I. triflora* (Forst.) Seem. from Fiji which was published in 1866. He provided a new name *Ixora queenslandica* Fosberg for this taxon which is recognised as an extant species in that genus (Forster & Halford 2002). The name *Tarenna triflora* (Benth.) Ali & Robbr. (1991) based on *Ixora triflora* R.Br. ex Benth. *nom. illeg.* is therefore a superfluous and illegitimate name.

Diplospora ixoroides F.Muell. was described in 1875 because Mueller considered Bentham's description of *I. triflora* R.Br. ex Benth. inappropriate. He combined *I. triflora* under *D. ixoroides* but did not cite any of Bentham's syntypes, nor select a lectotype. His description and the two specimens he cited under this species name *viz.* Port Denison, *Fitzalan*, and Neerkoll Creek, *Bowman*, match the syntypes of *I. triflora* from Rockhampton, *Thozet* (MEL); Rockhampton, *Dallachy* (MEL), and the flowering specimens of Brown's collection from the East Coast (specimens at K, MEL), and also probably with Broad Sound, *leg. Bowman* (see above).

McGillivray (1972) lectotypified *Diplospora ixoroides* F.Muell. (as *Ixora triflora* R.Br. ex Benth. *nom. illeg.)* with one of Bentham's syntypes (of *I. triflora* R. Br. ex

[4] Banks and Solander's collection from the Bay of Islets (BRI) is a flowering specimen of *Ixora queenslandica* Fosberg. The illustration provided by Miller, in Britten, *Illustr. Cooks Voy. 2*: p. 145, tab. 141 (May 1901) based on this collection is this species and not *Diplospora ixoroides* as captioned.

Benth.) *viz.* Rockhampton, *Dallachy* (lecto K, isolecto MEL). This specimen, however, is referrable to *D. ixoroides* (see above), so he had therefore actually lectotypified *D. ixoroides* F.Muell.

***Conservation status*:** *Triflorensia ixoroides* is widespread and not threatened. It is present in Auburn River, Carnarvon, Expedition, Palmgrove and Taunton National Parks, as well as numerous State Forests.

***Etymology*:** The specific epithet undoubtedly alludes to the superficial appearance of this species to plants of the unrelated Rubiaceous genus *Ixora.*

Acknowledgements

STR is grateful to Les Pedley for the Latin diagnosis, Rod Henderson for his advice on nomenclature, Gordon Guymer for checking and photographing the types during his term as ABLO at Kew, Diane Bridson for discussions on *Tarenna* in Australia, Will Smith for the illustrations and maps, the Australian Biological Resources Study for part funding of this revision, and the curators of the AD, BM, CANB, DNA, K, L, MEL, NSW, PERTH and QRS for the loan of specimens including types.

References

Ali, S.J. & Robbrecht, E. (1991). Remarks on the Tropical Asian and Australian taxa included in *Diplospora* or *Tricalysia* (Rubiaceae-*Ixoroideae-Gardenieae*). *Blumea* 35: 279–305.

Andreasen, K. & Bremer, B. (2000). Combined phylogenetic analysis in the Rubiaceae – *Ixoroideae*: morphology, nuclear and chloroplast DNA data. *American Journal of Botany* 87: 1731–1748.

Andreasen, K., Baldwin, B.G. & Bremer, B. (1999). Phylogenetic utility of the nuclear rDNA ITS region in the subfamily *Ixoroideae* (Rubiaceae): comparisons with cpDNA *rbcL* sequence data. *Plant Systematics & Evolution* 217: 119–135.

Bakhuizen Van Den Brink JR., R.C. (1975). A synoptical key to the genera of the Rubiaceae of Thailand. *Thai Forest Bulletin (Botany)* 9: 15–51.

Bailey, F.M. (1900). *Webera* Schreb.; *Diplospora* DC. *The Queensland Flora* 3: 752, 757–758. Queensland Government: Brisbane.

Bentham, G.W. (1867). *Webera* Schreb.; *Diplospora* DC. *Flora Australiensis* 3: 412–413. Lovell Reeve & Co.: London.

Bremer, B., Jansen, R.K., Ozelman, B., Backlund, M., Lantz, H. & Kim, K-J. (1999). More characters or more taxa for a robust phylogeny – case study from the coffee family Rubiaceae. *Systematic Biology* 48: 413–435.

Bridson, D.M. (1979). Studies in *Tarenna* sensu lato (Rubiaceae subfam. *Cinchonoideae*) for part 2 of "Flora of Tropical East Africa: Rubiaceae". *Kew Bulletin* 34: 377–402.

Bridson D.M. & Robbrecht E. (1985). Further Notes on the tribe *Pavetteae* (Rubiaceae). *Bulletin du Jardin botanique national de Belgique/ Bulletin van de Nationale Plantentuin van België* 55: 83–115.

Cooper, W. & Cooper, W.T. (2004). *Fruits of the Tropical Australian Rainforest*. Nokomis Editions Pty Ltd.: Melbourne.

Cronquist, A. (1988). *The Evolution and Classification of Flowering Plants*, 2nd edition. New York Botanical Garden: Bronx, New York.

Darwin, S.P. (1979). A synopsis of the indigenous genera of Pacific Rubiaceae. *Allertonia* 2: 1–44.

Dunlop, C.R. (1987). *Checklist of Vascular Plants of the Northern Territory.* Technical Report No. 26. Conservation Commission of the Northern Territory: Darwin.

Forster, P.I. & Halford, D.A. (2002). Rubiaceae. In R.J.F. Henderson (ed.), *Names and Distribution of Queensland Plants, Algae and Lichens,* pp. 173–177. Environmental Protection Agency: Brisbane.

Forster, P.I. (2004). The tribe *Coffeeae* DC. (Rubiaceae: Ixoroideae) in Australia. *Austrobaileya* 6: 903–909.

Fosberg, F.R. (1938). Two Queensland Ixoras. *Journal of Botany* 76: 233–237.

Hauser, J. & Blok, J. (1998). *Fragments of Green.* 2nd edition. Australian Rainforest Conservation Society: Bardon.

Hooker, J.D. (1882). *Webera* Schreb. *Flora of British India* 3: 101–107. L. Reeve & Co.: London.

Hyland, B.P.M., Whiffin, T., Christophel, D.C., Gray, B., Elick, R.W. & Ford, A.J. (1999). *Australian Tropical Rain Forest Trees and Shrubs.* CD-ROM. CSIRO Publishing: Melbourne.

Hyland, B.P.M., Whiffin, T., Christophel, D.C., Gray, B. & Elick, R.W. (2003). *Australian Tropical Rain Forest Plants. Trees, Shrubs and Vines.* CD-ROM. CSIRO Publishing: Melbourne.

James, T.A. (1992). *Diplospora*. In G.J. Harden (ed.), *Flora of New South Wales* 3: 504. New South Wales University Press: Kensington.

JEREMIE, J. (1974). A propos du genre *Tarenna* (Rubiaceae-*Gardeniae*) en Nouvelle-Calédonie. *Adansonia*, ser. 2, 4: 473–380.

JONES, D.L. (1986). *Ornamental Rainforest Plants in Australia.* Reed Books Pty. Ltd.: Frenchs Forest.

JUDD, W.S., CAMPBELL, C.S., KELLOGG, E.A., STEVENS, P.F. & DONOGHUE, M.J. (2002). *Plant Systematics – a phylogenetic approach*. 2nd edition. Sinauer Associates Inc.: Sunderland, Massachusetts.

KOCH, B.L. (1992). *Tarenna* Gaertner. In J.R. Wheeler (ed.), *Flora of the Kimberley Region*, pp. 929–930. Western Australian Herbarium, Department of Conservation & Land Management: Como.

LEVIN, D.A. (1979). The nature of plant species. *Science* 204: 381–384.

LEVIN, D.A. (2000). *The Origin, Expansion, and Demise of Plant Species.* Oxford University Press: Oxford.

LIDDLE, D.T., RUSSELL-SMITH, J., BROCK, J., LEACH, G.J. & CONNORS, G.T. (1994). *Atlas of the Vascular Rainforest Plants of the Northern Territory*. Flora of Australia Supplementary Series No. 3. Commonwealth of Australia: Canberra.

MCGILLIVRAY, D. (1972). A nomenclatural tour (*Ixora queenslandica* Fosberg). *Contributions from the New South Wales National Herbarium* 4: 262–264.

MOORE, S. (1926). Notes on *Ixora triflora* R.Br. *Journal of Botany* 64: 215–216.

MUELLER, F. (1867). Rubiaceae. *Webera expandens. Fragmenta Phytographie Australie* 6: 25–26. Government Printer: Melbourne.

MUELLER, F. (1875). Rubiaceae. *Fragmenta Phytographie Australie* 9: 179–188. Government Printer: Melbourne.

NEW SOUTH WALES SCIENTIFIC COMMITTEE (2004). *Threatened Species Conservation Act. Schedules 1, 2 and 3*. New South Wales Government: Sydney.

REYNOLDS, S.T. (1993). The genus *Pavetta* L. (Rubiaceae) in Australia. *Austrobaileya* 4: 21–49.

REYNOLDS, S.T. (1997). Rubiaceae. In R.J.F. Henderson (ed.), *Queensland Plants: Names and Distribution,* pp. 180–184. Queensland Herbarium, Department of Environment: Brisbane.

RIDSDALE, C.E. (1998). Rubiaceae. In M.D. Dassanayake & W.D. Clayton (eds.), *A Revised Handbook to the Flora of Ceylon* 12: 141–343. A.A. Balkema: Rotterdam/Brookfield.

ROBBRECHT, E. (1988). Tropical woody Rubiaceae. *Opera Botanica Belgica* 1: 1–271.

ROBBRECHT, E. (1993). Supplement to the 1988 outline of the classification of the Rubiaceae. *Opera Botanica Belgica* 6: 173–196.

ROSS, E.M. (1986). *Diplospora* DC. In T.D. Stanley & E.M. Ross, *Flora of South-eastern Queensland* 2: 336–337. Queensland Department of Primary Industries: Brisbane.

SMITH, A.C. & DARWIN, S.P. (1988). Family 168. Rubiaceae. In A.C. Smith (ed.), *Flora Vitiensis Nova* 4: 143–376. SB Printers: Lawai, Kauai.

SPECHT, R.L. (1958). The history of botanical exploration in the Arnhem Land Aboriginal Reserve. In R.L. Specht & Mountford, C.P. (eds.), *Records of The American-Australian Scientific Expedition to Arnhem Land 3: Botany and Plant Ecology*, pp. 1–7. Melbourne University Press: Melbourne.

STACE, C.A. (1989). *Plant Taxonomy and Biosystematics*. 2nd edition. Edward Arnold: London, Melbourne, Auckland.

STEBBINS, G.L. (1950). *Variation and Evolution in Plants*. Columbia University Press: New York.

STUESSY, T.F. (1990). *Plant Taxonomy.* Columbia University Press: New York.

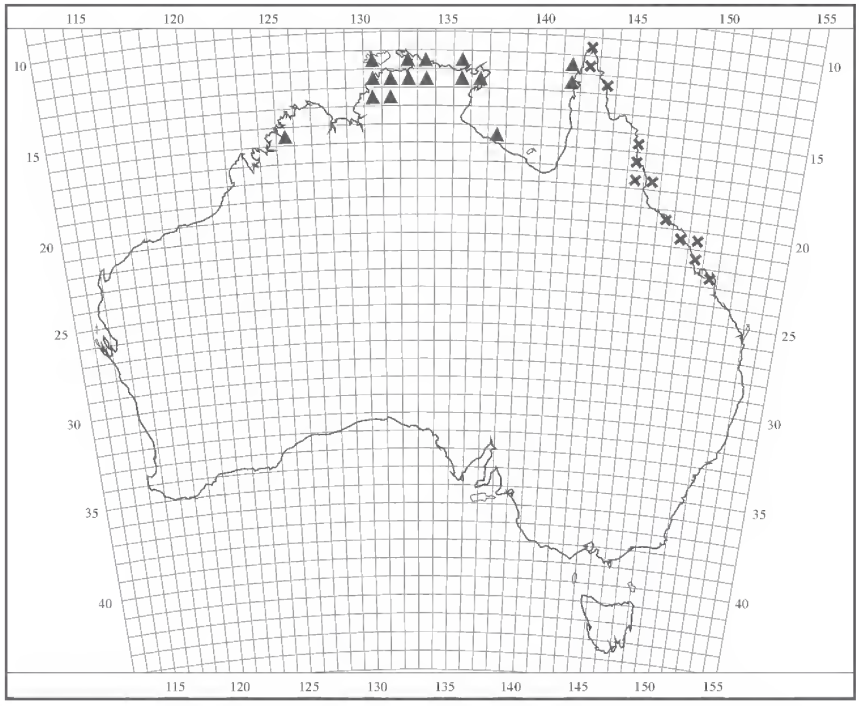
VALETON T. (1924). Die Rubiaceae von Papuasien. In C. Lauterbach's Beiträge zur Flora von Papuasien, ser. 13. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 60: 1–104.

VALLANCE, T.G. (1990). Jupiter Botanicus in the bush: Robert Brown's Australian fieldwork, 1801–5. *Proceedings of the Linnean Society of New South Wales* 112: 49–86.

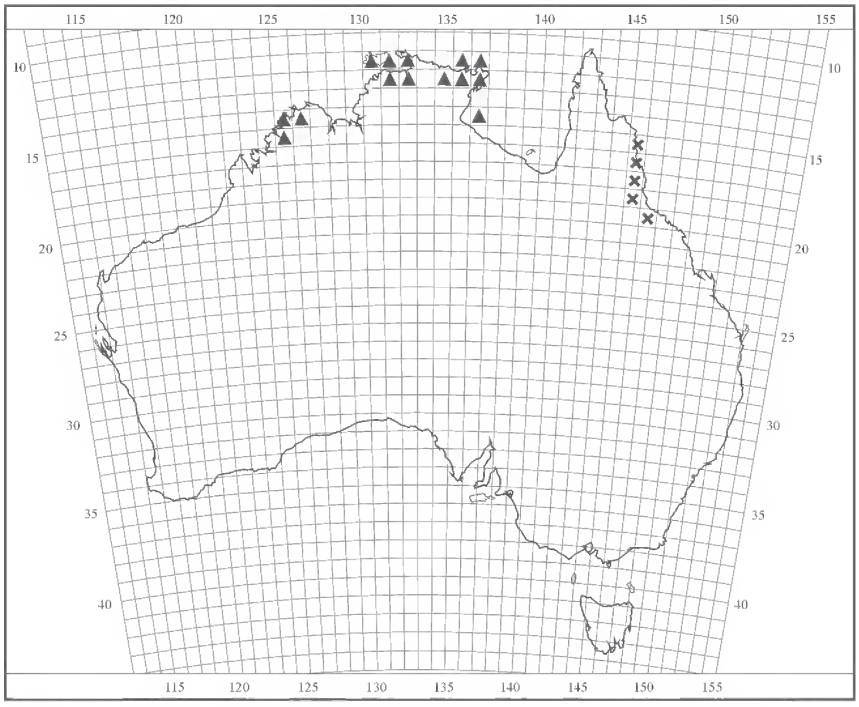
VALLANCE, T.G., MOORE, D.T. & GROVES, E.W. (2001). *Nature's Investigator, The Diary of Robert Brown in Australia, 1801–1805*. Australian Biological Resources Study: Canberra.

WHITE, C.T. (1926). A new species of *Diplospora* from southern Queensland. *Journal of Botany* 64: 216–217.

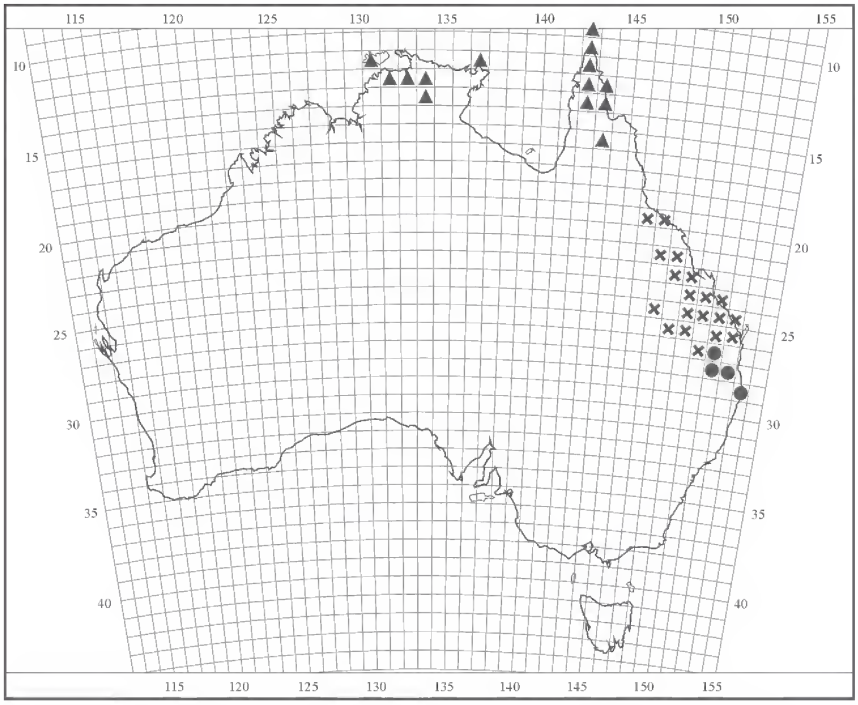
WONG K.M. (1989). *Tarenna* Gaertn. In F.S.P Ng (ed.). *Tree flora of Malaya* 4: 409–416. Longman (Malaysia): Kuala Lumpur.



Map 1. Distribution in 1° grids in Australia for *Tarenna dallachiana* subsp. *dallachiana* × and *Tarenna dallachiana* subsp. *expandens* ▲.



Map 2. Distribution in 1° grids in Australia for *Tarenna monticola* × and *Tarenna pentamera* ▲.



Map 3. Distribution in 1° grids in Australia for *Triflorensia australis* ▲, *Triflorensia ixoroides* ✖ and *Triflorensia cameronii* ●.

A taxonomic revision of *Actephila* Blume (Euphorbiaceae/Phyllanthaceae) in Australia

Paul I. Forster

Summary

Forster, P.I. (2005). A taxonomic revision of *Actephila* Blume (Euphorbiaceae/Phyllanthaceae) in Australia. *Austrobaileya* 7(1): 57–98. The genus *Actephila* Blume is revised for Australia. Fourteen native and endemic species (one with two subspecies) are recognised: *A. bella* P.I.Forst. sp. nov., *A. championiae* P.I.Forst. sp. nov., *A. flavescens* P.I.Forst. sp. nov., *A. foetida* Domin, *A. grandifolia* (Müll.Arg.) Baill., *A. latifolia* Benth., *A. lindleyi* (Steud.) Airy Shaw, *A. longipedicellata* P.I.Forst., *A. petiolaris* Benth subsp. *petiolaris, A. petiolaris* subsp. *jagonis* P.I.Forst. subsp. nov., *A. plicata* P.I.Forst. sp. nov., *A. sessilifolia* Benth., *A. traceyi* P.I.Forst. sp. nov., *A. venusta* P.I.Forst. sp. nov., and *A. vernicosa* P.I.Forst. sp. nov. An identification key to species is provided. All taxa are described and most species illustrated. Notes are provided on distribution, habitat, typification, affinities and conservation status for each taxon.

Key Words: Euphorbiaceae, Phyllanthaceae, Australian flora, *Actephila bella, Actephila flavescens, Actephila grandifolia, Actephila longipedicellata, Actephila petiolaris* subsp. *jagonis, Actephila plicata, Actephila traceyi, Actephila venusta, Actephila vernicosa*

P.I.Forster, Queensland Herbarium, Environmental Protection Agency, Brisbane Botanic Gardens, Mt Coot-tha Road, Toowong, Queensland 4066, Australia. Email: paul.forster@epa.qld.gov.au

Introduction

The genus *Actephila* was described by Blume (1825) who did not include any species at the time. The first species to be included in *Actephila* were *A. bantamensis* Miq. (now a synonym of *A. javanica* Miq.) and *A. javanica* (Miquel 1859), although other species were described prior to this date in other genera and are now included in *Actephila* (e.g. Dalzell (1851) with *Anomospermum excelsum* (now *Actephila excelsa* (Dalzell) Müll.Arg.) and Steudel (1841) with *Lithoxylon lindleyi* (now *A. lindleyi* (Steud.) Airy Shaw). Numerous species were described between 1865 and 1978 and there are currently around 20 species of *Actephila* recognised worldwide from Australia, China, India, Indonesia, Malaysia, New Guinea, India, Laos, Sri Lanka, Solomon Islands, Thailand and Vietnam (Airy Shaw 1980a, 1981; Philcox 1997; Govaerts *et al.* 2000; Chayamarit in press; Li & Hoffmann in press). Most authors consider that the species level systematics of the genus is difficult (Govaerts *et al.* 2000; Radcliffe-Smith 2001) and it is likely that the number of species in the genus will increase once the Malesian species are revised.

Accepted for publication 13 July 2005

Although the traditional taxonomic placement of *Actephila* in Euphorbiaceae subfamily *Phyllanthoideae* (or family Phyllanthaceae) has not been challenged recently, it remains to be rigorously tested using molecular data and additional information from the areas of anatomy (particularly seeds), chemistry and embryology. An initial classification of Euphorbiaceae *s.l.* by Müller (1866) placed the genus together with *Amanoa* Aubl., *Cluytiandra* Müll.Arg., *Cyathogyne* Müll.Arg., *Discocarpus* Klotzsch, *Lachnostylis* Turcz., *Moacurra* Roxb., *Payeria* Baill., *Pentabrachion* Müll.Arg., *Savia* Willd. and *Secretania* Müll.Arg., in the tribe *Phyllantheae* Müll.Arg. subtribe *Savieae* Müll.Arg. Pax & Hoffman (1922, 1931) included *Actephila* in the subfamily *Phyllanthoideae* Ascherson, subtribe *Amanoinae* Pax & K.Hoffm., together with *Amanoa*. Webster (1994) included the genus in the subfamily *Phyllanthoideae*, tribe *Wielandieae* Baill. ex Hurus., together with the genera *Blotia* Leandri, *Chonocentrum* Pierre ex Pax & K.Hoffm., *Discocarpus*, *Gonatogyne* Müll.Arg., *Heywoodia* Sim, *Lachnostylis, Savia* and *Wielandia* Baill., but made no definitive statement on the closeness of any of these genera to *Actephila*. A similar disposition of genera within this tribe was outlined by

Radcliffe-Smith (2001), with the addition of the genera *Chonocentrum* Pierre ex Pax & K.Hoffm. and *Petalodiscus* (Baill.) Pax. In both of these recent, morphologically based overviews, *Actephila* was keyed out next to *Blotia*, a genus from Madagascar. Most recently it has been proposed that the subfamily *Phyllanthoideae* be again recognised at family level as the Phyllanthaceae (Chase *et al.* 2001; APG 2003). Limited molecular analysis of genera placed in the Phyllanthaceae has revealed that *Actephila* is allied to the genera *Andrachne* L., *Leptopus* Decne., *Meineckia* Baill., *Poranthera* Rudge and *Zimmermannia* Pax, with the closest relationship to *Andrachne* and *Leptopus* (Wurdack *et al.* 2004; Samuel *et al.* 2005).

As with many genera of Euphorbiaceae *s.l.*, *Actephila* remains poorly studied in terms of its anatomy, chemistry or micromorphology. The available taxonomic classifications of the genus are based mainly on gross morphology and it is likely that further molecular analysis will reveal patterns of relationship to other genera in Phyllanthaceae that are different again to those recently proposed. On the basis of wood anatomy of a single species of *Actephila* (*A. javanica*), Mennega (1987) considered that the genus was close to *Pentabrachium*. Levin (1986a-c) studied leaf architecture and epidermal morphology of two species of *Actephila* and concluded that they were most similar to those from the genus *Andrachne* L. Tokuoka & Tobe (2001) described the seed coat anatomy of two species of *Actephila* from Asia as exotegmic and the cells of the exotegmen as stellate-undulate. A similar seed coat anatomy was found in two species of *Savia* and led these authors to speculate that the two genera may be closely related. They further stated that the "Wielandieae are morphologically unlikely to be monophyletic". The lack of endosperm in the seeds of *Actephila, Amanoa, Spondianthus* and *Wielandia* was considered primitive within the group (Tokuoka & Tobe 1995).

Species Delimitation

The morphological or phenetic species concept used, has been implicit in previous revisions of Australian Euphorbiaceae *s.l.* (Forster 1994a-d, 1995a,b, 1996a,b, 1997a,b, 1999a,b, 2003). This species concept is closely tied to habitat preferences and geographic distribution and is arrived at from extensive fieldwork in northern Australia, particularly Queensland where all of the Australian species are found.

Species are defined as groups of populations (1-many) with discontinuities in the variation of two or more independent character states of morphology. It is assumed that there is genetic continuity or at least a shared ancestral lineage between the different populations of a single species. Although species definitions remain a matter of opinion and debate, the one applied here ('phenetic species concept') is widely used and understood (Stebbins 1950; van Steenis 1957; Cronquist 1988; Stuessy 1990; Levin 1979, 2000) and would also equate to the 'diagnostic species concept' of Judd *et al.* (2002).

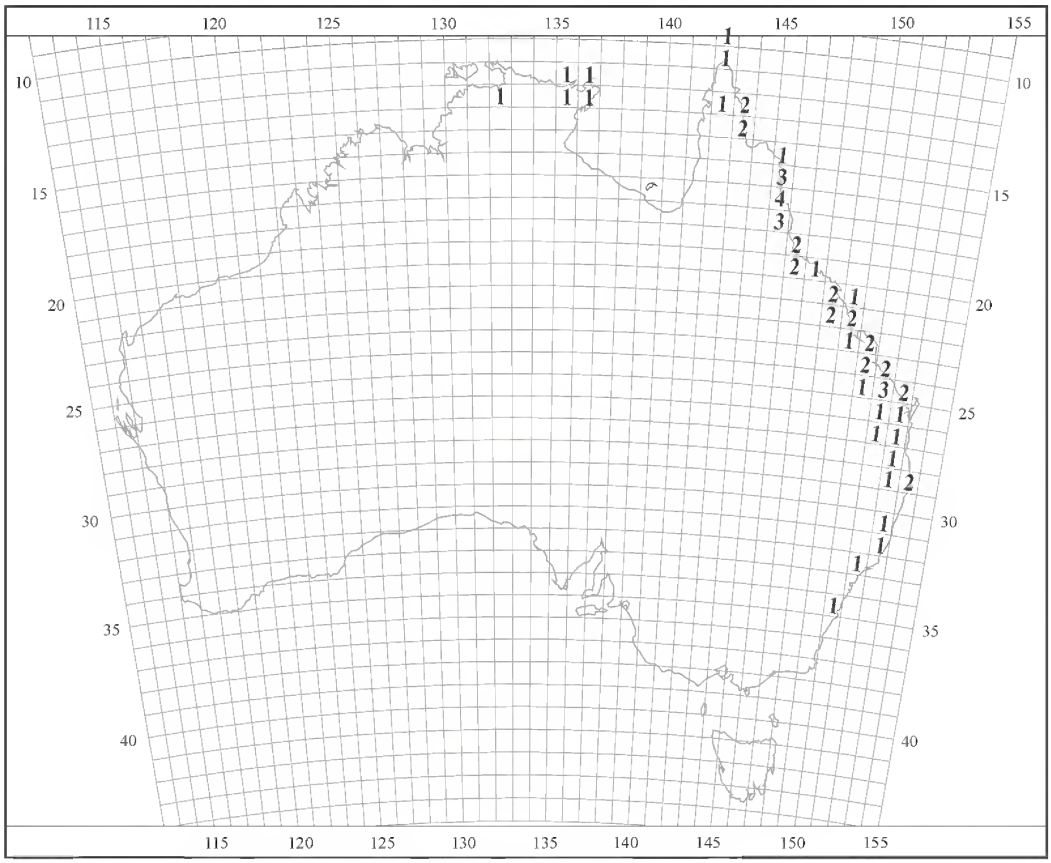
If only a single, or several minor (indumentum colour or density) character state differences are present and the discontinuity is geographically based, the rank of subspecies is used. It is generally considered that subspecies should differ in only a few minor characters and that intermediate populations should exist to demonstrate continuity of character states (e.g. Stebbins (1950) states "subspecies.... connected .... by a series of intergrading forms" or Stace (1989) states "a population of several biotypes forming a more or less distinct regional facies of a species ..... a geographical race, ecotype, topodeme or genoecodeme").

Australian species of *Actephila* are the only euphorbs *s.l.* occurring in rainforests to have been examined by electrophoretic methods, *viz.* isozyme analysis (Shapcott 1998). That work examined a small number of populations from the species *A. grandifolia, A. lindleyi* and *A. vernicosa* and although it revealed variation, the sampling was insufficient to draw wider conclusions. Electrophoretic data is variable in its usefulness in distinguishing specific taxa in other plant groups (e.g. cycads: Sharma *et al.* 1998, 1999, 2004). Morphologically discrete species may differ little genetically (see references in Sharma *et al.* 1998) and the application of isozymes to taxonomic decisions is limited as speciation can occur without divergence at enzyme loci or

divergence in allozyme loci can occur without speciation (Crawford 1989). The conserved nature of allozyme variation responsible for these apparently low levels of variation (Bossart & Prowell 1998) may not be reflected in results from more informative molecular techniques such as amplified fragment length polymorphisms (AFLP), microsatellites (ITS) or inter-simple sequence repeats (ISSR).

The delimitation of species for this genus in Australia has been difficult, as considerable variation occurs for each taxon, nearly all of which are known from a range of disjunct populations in eastern and northern parts of the continent (**Map 1**). Fertile material can be hard to obtain, and unless care is taken, most flowers are lost from dried specimens as they often abscise during the drying process. This has resulted in a limited sampling of floral diversity from the available herbarium collections. Despite this, all of the species recognised below are distinctive when encountered in habitat. The habit of the individual plant and form of the foliage changes little when the plants are cultivated. Further characters are undoubtedly to be found in the morphology of seedlings based on limited observations of cultivated plants; however, in the absence of comprehensive information of this sort it is the intention of this revision to provide a classification and identification key that can be used with vegetative adult material.

The first species to be recognised for Australia was *Actephila lindleyi* (as the misapplied name *Securinega nitida* Lindl.) in 1821 (Airy Shaw 1971). Further species were added by Mueller (1865) and Baillon (1866a), although these were considered conspecific with *A. lindleyi* by Airy Shaw (1971). The basic classification framework for Australian species



Map 1. Distribution of *Actephila* in Australia within 1° grids and species diversity.

was established by Bentham (1873) who named *A. latifolia*, *A. petiolaris* and *A. sessilifolia*, as well as recognising *A. lindleyi* (as *A. nitida*). Over 100 years later little had changed with Airy Shaw (1980b, 1980c, 1981) recognising five species, *A. foetida* Domin, *A. latifolia*, *A. lindleyi*, *A. petiolaris* and *A. sessilifolia* for the genus in Australia.

The current revision represents a major departure from the long-accepted status quo of species diversity in the Australian species of *Actephila*, with the number of species more than doubled. This has been due to a number of factors, most notably the considerable accumulation of herbarium material (together with supporting spirit collections) during the 1980's and 1990's from previously known populations, and secondly continued botanical exploration of the rainforests of Australia that has resulted in the discovery of new populations and undescribed taxa. The presence of several of these undescribed species has been indicated in the allozyme study of Shapcott (1998) for a small number of species (*A. grandifolia*, *A. lindleyi*, *A. vernicosa* of this account), census accounts of the flora of Queensland (Forster & Henderson 1997; Forster & Halford 2002), and identification manuals to rainforest plants (Hyland *et al.* 1999, 2003; Cooper & Cooper 2004).

Reproductive Ecology

Ecology of *Actephila* species has been barely studied and little more than circumstantial and anecdotal information is available on their reproduction, pollination, dispersal and recruitment. Floyd (1989) stated that *A. lindleyi* fruit were "eaten by [the] brown cuckoo-dove" and that "cuttings strike easily". All of the Australian species of *Actephila* comprise small trees, shrubs or subshrubs and occur in rainforest (mature phase) communities in New South Wales, the Northern Territory and Queensland. Plants tend to mass flower following rain between October and December. Flowering is often associated with the production of new leaves and the shape and colour of these unhardened leaves is often quite different to the mature leaves that are present by the time of fruiting. This pattern of floral and vegetative phenology is similar to other species of Euphorbiaceae and Putranjivaceae that occur in these habitats, e.g. *Croton* (Forster 2003), *Drypetes* (Forster 1997b) or *Mallotus* (Forster 1999b).

The Australian species of *Actephila* are monoecious, a trait commonly associated with Euphorbiaceae *s.l.* in this region (Gross 2005). The flowers are clustered in small axillary fascicles with staminate flowers usually greatly outnumbering pistillate ones, but there is no spatial or temporal separation of the sexes as is found in species of *Croton* (Forster 2003) or *Mallotus* (Forster 1999b). In *Actephila* it is not unusual to observe individuals with inflorescences where the flowers are all of one sex (usually male), particularly if the plants are recovering from a period of stress (usually drought); however it is uncertain whether this indicates evolution of androdioecy, "the presence of male-only and hermaphroditic plants in a population" (Charlesworth 1984; Thomson *et al.* 1989) without quantitative observations. An alternative explanation is that *Actephila* plants may be gender diphasic, i.e. the plants 'change sex' (Lloyd 1982; Korpelainen 1998; Richardson & Clay 2001), with many of the 'male' plants later having both male and female flowers.

Pollinators of *Actephila* are undocumented, but the shallow, bowl-like flowers are perhaps most suited to generalist insect pollinators with short proboscises (Endress 1994), as has been found in *Drypetes* (Forster 1997b) (Euphorbiaceae/Putrajivaceae) by Williams & Adam (1997) or postulated for *Croton* (Forster 2003). The presence of foetid smelling flowers in species such as *Actephila foetida* and *A. traceyi* may indicate that flies are the primary pollinators and this group of insects are sometimes the only pollinators in dioecious species (Bawa 1980; Charlesworth 1993; Renner & Feil 1993). Although the possibility of wind pollination (Williams & Adam 1999) cannot be discounted without experimentation, it is perhaps less likely due to the occurrence of *Actephila* populations in the rainforest understorey where wind speed is greatly reduced (Turner 2001).

Plants of *Actephila* when cultivated in areas well removed from their natural habitats still produce fruit with fertile seed (R. Jensen, G. Sankowsky, M.C. Tucker, pers. comm. 2004) and this has been interpreted as indicating that generalist pollination by opportunistic insects is occurring (Tucker & Simmons 2004). The possibility of apomixis or agamospermy (i.e. "the development of seeds without preceeding fertilization"), as found for the euphorbiaceous *Alchornea ilicifolia* (Smith 1841; Baillon 1866c; Endress 1994; Bicknell & Koltunow 2004) is more likely, but needs to be experimentally confirmed. Agamospermous reproduction may also explain the apparent morphological uniformity of plants within any given population of *Actephila* resulting from long-term recruitment of genetically similar individuals.

Pistillate flowers are often persistent on the plant with both the pedicels and floral parts increasing in size until the perianth (especially the petals) withers and the fruit develops. At what stage these flowers cease to be functionally receptive to pollination and should be regarded as developing fruit is uncertain and a somewhat arbitrary distinction in the morphological descriptions has been made based on persistence of the petals. Esser (2003) considered that the genus *Actephila* was characterised by autochorous/diplochorous fruit dehiscence and dispersal, whereby the fruits are ballistically explosive (ballistochores, *viz.* Turner 2001), followed by myrmechory.

The seeds of *Actephila* have highly reduced or no caruncles present, so once they have been explosively ejected could be dispersed by ants that move the seeds as a result of being attracted to a food reward. These caruncles are significantly smaller (percentage of the seed volume) than those found in other Australian Euphorbiaceae *s.l.* such as *Acalypha* L. (Forster 1994b), *Austrobuxus* Miq. (Forster 1997a), *Bertya* Planch. (Halford & Henderson 2002a), *Croton* L. (Forster 2003), *Dissiliaria* F.Muell. ex Baill. (Forster 1996b), *Micrantheum* Desf. (Berg 1975), *Monotaxis* Brongn. (Halford & Henderson 2002b), *Petalostigma* F.Muell. (Forster & van Welzen 1999), *Pseudanthus* Sieber ex Spreng. (Halford & Henderson 2003), *Sankowskya* P.I.Forst. (Forster 1995a), *Stachystemon* Planch. (Halford & Henderson 2003) and *Wyanbeelia* Airy Shaw & B.Hyland (Forster unpubl.) and their use as a food source by invertebrates has yet to be observed. Species with this dispersal pattern are unlikely to have regular, long-distance dispersal, i.e. greater than 100 m from the parent (Cain *et al.* 1999) and most seeds of rainforest trees fall within 10 m of the parent plant (Turner 2001). This dispersal pattern usually results in a markedly clumped disposition of individuals, especially for species that inhabit the understorey and midstratum of rainforests, but has only been quantitatively documented for *A. lindleyi* at one locality in south-eastern Queensland (Butler 2004). In species such as *A. bella, A. championiae, A. latifolia, A. petiolaris, A. plicata, A. sessilifolia* and *A. vernicosa*, the boundaries of populations are often sharp, indicating "dispersal limited distribution" (Primack & Miao 1992). In comparison species such as *A. grandifolia*, *A. lindleyi* and *A. venusta* do not always have such a 'sharp' boundary to populations, and although individuals are clumped, they are generally more widely scattered within rainforest patches.

Australian Distribution and Diversity

Australia is the major centre of diversity for *Actephila* with at least fourteen endemic species. There are collectively fewer species combined in the other regions where the genus has been found. The Australian species are also the most morphologically diverse with the observed variation mainly that of leaf morphology and foliage indumentum. The most distinctive species in the whole genus is undoubtedly *A. foetida* with its massive leaves and foliage indumentum. Toothed leaves, as found in *A. excelsa* from Malesia, have not been observed in the Australian species.

As yet no infrageneric phylogeny has been proposed for *Actephila*; however, obvious morphological groupings of the Australian species are (1) *A. bella, A. foetida, A. petiolaris*, (2) *A. flavescens, A. grandifolia, A. lindleyi, A. traceyi, A. venusta, A. vernicosa*, (3) *A. championiae, A. latifolia, A. plicata*, (4) *A. longipedicellata, A. sessilifolia.* These informal groupings are based on morphological similarities in leaf and fruit morphology. Similar appearing, yet distinct, species occur in New

Guinea and elsewhere; however my knowledge of these taxa is insufficient to suggest further groupings throughout the genus range.

Species of *Actephila* are restricted to rainforests in eastern and northern Australia (**Map 1**), although they are absent from the Kimberley of Western Australia and are found south only to central New South Wales. Species sympatry is rarely encountered with the only instances I am familiar with being (1) *A. lindleyi* – *A. sessilifolia* at Bundaberg) and (2) *A. plicata* – *A. sessilifolia* at Mt Dryander near Proserpine. Hence the current day distribution pattern of species, especially within rainforests of similar structure and floristic composition, is essentially allopatric. This is strictly the case for the species within each of the groups outlined above with the geographic disjunctions ranging from nearby (e.g. *A. championiae* – *A. plicata*; *A. foetida* – *A. petiolaris*; *A. grandifolia* – *A. lindleyi*; *A. traceyi* – *A. venusta*) to far flung (e.g. *A. bella* – *A. petiolaris*; *A. flavescens* – *A. lindleyi*; *A. longipedicellata* – *A. sessilifolia*).

While there are minor centres of species diversity in Australian *Actephila*, i.e. three grid cells in the 'Wet Tropics' and one grid cell near Miriamvale with three or four species each (**Map 1**), there is no overall similarity with the patterns of species distribution and diversity found in the Australian taxa of *Croton* L. with many more species (Forster 2003) or *Mallotus* Lour. that has a similar number of species (Forster 1999b).

Materials and Methods

This revision is based on herbarium holdings at BRI, CANB (including CBG), DNA, MEL, NSW and QRS, photographs or microfiche of types at G-DC, K, L, P and U, and field collections and observations of all taxa by the author. Representative material (including types) of *Actephila* species from New Guinea and Indonesia were examined at BRI, CANB, L and QRS.

Most species of *Actephila* remain poorly collected, and the descriptions for most of the species in this revision are based on few fertile collections. Floral descriptions are incomplete for *A. bella, A. flavescens, A. petiolaris* subsp. *jagonis* and *A. plicata*. Collectors should ensure that both male and female flowers are obtained when making specimens of *Actephila*. It is not unusual to encounter mass flowering individuals of *Actephila*; however, most flowers are lost from specimens when the material is handled and dried. If spirit for flower/fruit pickling is available for use in the field, then flowers or fruit should be immediately pickled. Male flowers usually greatly outnumber females giving the impression that the plants are dioecious, but careful searching will usually result in location of material of both sexes.

Floral descriptions were prepared from material preserved in spirit (FAA or 70% alcohol and glycerol) or reconstituted by boiling in water and detergent. Fruit descriptions were prepared from spirit and dried material. Foliage, inflorescence and seed descriptions were prepared from dried material.

The degree of leaf margin recurving is useful in specific delimitation and distinctions have been made between 'flat' (the leaf lamina margin is in the same plane as the rest of the leaf lamina), 'recurved' (the leaf lamina margin is curved in a plane 0-90° to the plane of the leaf lamina) and 'revolute' (the leaf lamina margin is curved in a plane 90-180° to the plane of the leaf lamina). Venation terminology largely follows Hickey (1973) and Ash *et al.* (1999) with the recognition of a midrib (1° vein order), lateral veins (2° vein order) and intercostal veins (3° and onwards vein orders) within any leaf lamina. When an intercostal vein comprises a continuous raised line of cells it is termed 'distinct'; if it is discontinuous or fades away into the body of the lamina, it is termed 'indistinct'. Indumentum cover is described using the terminology of Hewson (1988), except that 'scattered' is used instead of 'isolated'. The shapes of leaves, sepals and petals are described using the terminology of Hickey & King (2000).

Characters most commonly used in the identification key are those of indumentum cover, leaf lamina venation (especially vein order number and its expression) and leaf lamina margin form, colour of foliage parts (based on dried material), flowers (particularly disk form and size, sepal and petal shape and size). Use

of non-vegetative characters in the couplets has been avoided in most cases but is necessary to distinguish several species towards the end of the key.

Common abbreviations in the specimen citations are N.P. or N.P.R. (National Park or National Park Reserve), L.A. (Logging Area), F.R., S.F. or S.F.R. (Forest Reserve, State Forest or State Forest Reserve), T.R. (Timber Reserve) and V.C.L. (Vacant Crown Land).

NCA is an abbreviation for the Queensland Nature Conservation Act (1992) and its associated schedules. Discussions of conservation rankings are made using the criteria of the IUCN (2001).

Rainforest structural terminology follows Webb (1978). The 'Wet Tropics' is defined as that area of north-eastern Queensland which encompasses the 'hot, humid vine forests' from near Cooktown in the north to Paluma in the south (Webb & Tracey 1981), and is equivalent to the bioregion of the same name (Goosem *et al.* 1999). For the purposes of the key, 'Central Qld' comprises the pastoral districts of North Kennedy, South Kennedy and Port Curtis; 'Southern Qld' comprises the pastoral districts of Burnett, Darling Downs, Moreton and Wide Bay; 'Cape York Peninsula' is that part of Queensland north of the 'Wet Tropics'.

Taxa are arranged alphabetically. Suggested affinities between taxa are indicated in the ***Notes*** section for each taxon.

Taxonomy

Actephila Blume, *Bijdr. Fl. Ned. Ind.* 581 (1825).

Savia section *Actephila* (Blume) Baill., *Étude Euphorb.* 571 (1858). **Type species:** *Actephila javanica* Miq.

Lithoxylon Endl., *Gen. Pl.* 2: 1122 (1840). **Type species:** *Securinega nitida* Lindley (*non* Willd. 1806).

Anomospermum Dalz., *Hook. J. Bot. Kew Gard. Misc.* 3: 228 (1851) (*non* Miers 1851). **Type species:** *Anomospermum excelsum* Dalz. [= *Actephila excelsa* (Dalz.) Muell.Arg.]

Perennial trees, shrubs or subshrubs, monoecious, evergreen; stems and foliage without latex. Indumentum of simple trichomes; scales, glandular trichomes and stinging trichomes absent. Stipules entire, generally inconspicuous, deciduous. Leaves alternate, subverticillate or subopposite, coriaceous or chartaceous, flat to plicate, ± sessile to petiolate, simple and elobate, penninerved, entire or toothed, glands absent. Inflorescences fasciculate, axillary, extra-axillary or rarely on short brachyblasts, or solitary, uni- or bisexual, with flowers in bracteate groups. Male flowers pedicellate; calyx lobes 4–6, imbricate, ± equal; petals 2–6, often scale-like or absent; disk extra-staminal, annular, 4–5 lobed, or entire and rounded; stamens 3–6, inserted on the disk, filaments free, filiform; anthers introrse, bilobate, thecae oblong and longitudinally dehiscent; pistillode trifid. Female flowers pedicellate; calyx lobes 4–6, imbricate; petals 2–6, usually often scale-like or absent; disk annular or cupular, fleshy; ovary 3-locular, locules biovulate; styles free or shortly connate at base, entire or bifid. Fruits capsular, trilobate to pentalobate, surface rough, glabrous or pubescent, dehiscing loculicidally and partly septicidally into bivalved cocci; columella persistent. Seeds deltoid; testa crustaceous; albumen absent; caruncles absent or present; cotyledons thick, sometimes plicate.

Between twenty-five and thirty species in Asia, Australia, Malesia and Melanesia. Fourteen species in Australia, all endemic.

Derivation of name*: *akte (seashore) and *phileo* (to love).

Key to Australian species of *Actephila*

1. Leaf lamina chartaceous (thin) . . . 2
   Leaf lamina coriaceous (thick, leathery) . . . 3
2. Branchlets with dense indumentum when young; leaf petioles18–78 mm long, dark olive-green when dry. . . . **4. A. foetida**
   Branchlets glabrous when young; leaf petioles 3–8 mm long, black-green when dry . . . **14. A. vernicosa**
3. Leaf lamina with up to 4 or 5° vein orders distinct . . . 4
   Leaf lamina with up to 3° vein orders distinct (rarely 4° in *A. lindleyi*) . . . 5
4. Leaf petiole length 2–8 mm long; lamina length/petiole length ratio 13.6–42.5 (Cape York Peninsula) . . . **8. A. longipedicellata**
   Leaf petiole length 9–80 mm long; lamina length/petiole length ratio 2–8.7 (Wet Tropics) . . . **9. A. petiolaris**
5. Leaf lamina with up to 2° vein orders distinct . . . 6
   Leaf lamina with up to 3° vein orders distinct (rarely 4° in *A. lindleyi*) . . . 9
6. Leaf margin flat to slightly recurved . . . 7
   Leaf margin revolute . . . 8
7. Leaf petiole cream when dried; lamina base obtuse or rounded (rarely subcordate) (Central Qld) . . . **1. A. bella**
   Leaf petiole olive-green when dried; lamina base acute (rarely rounded) (Cape York Peninsula, Northern Territory) . . . **13. A. venusta**
8. Leaf petiole length 10–44 mm long, green-yellow when dried; lamina base acute or rounded (rarely weakly cordate) . . . **2. A. championiae**
   Leaf petiole length 1–7 mm long, grey-fawn when dried; lamina base cordate to subcordate, often appearing stem-clasping . . . **11. A. sessilifolia**
9. Leaf margin revolute . . . 10
   Leaf margin flat to recurved (rarely revolute in *A. lindleyi*) . . . 11
10. Branchlets cream when dry; leaf petioles cream-yellow when dry; fruit rounded (Wet Tropics) . . . **3. A. flavescens**
    Branchlets brown when dry; leaf petioles olive-green when dry; fruit pentalobate (Central Qld) . . . **10. A. plicata**
11. Midrib of leaf lamina below prominently raised at lamina base (height > width) then decreasing towards apex (Wet Tropics) . . . **6. A. latifolia**
    Midrib of leaf lamina below strongly raised at lamina base (height < or ± equal to width) then decreasing towards apex (Cape York Peninsula, Central and Southern Qld, NSW) . . . 12
12. Male flower sepals 3.5–5 mm long, disk 5-angled; fruit 16–24 mm diameter (Cape York Peninsula) . . . **12. A. traceyi**
    Male flower sepals 1–3.5 mm long, disk annular or rounded; fruit 11–15 mm diameter (Central and Southern Qld, NSW) . . . 13
13. Abaxial leaf surface pale green and matt-glaucous, often drying brown; male flower pedicels 10–20 mm long, petals 1.4–1.5 × 0.5–0.7 mm . . . **5. A. grandifolia**
    Abaxial leaf surface pale green-yellow and glossy, often drying pale brown; male flower pedicels 1.5–5 mm long, petals 2–2.5 × 0.8–1.3 mm . . . **7. A. lindleyi**

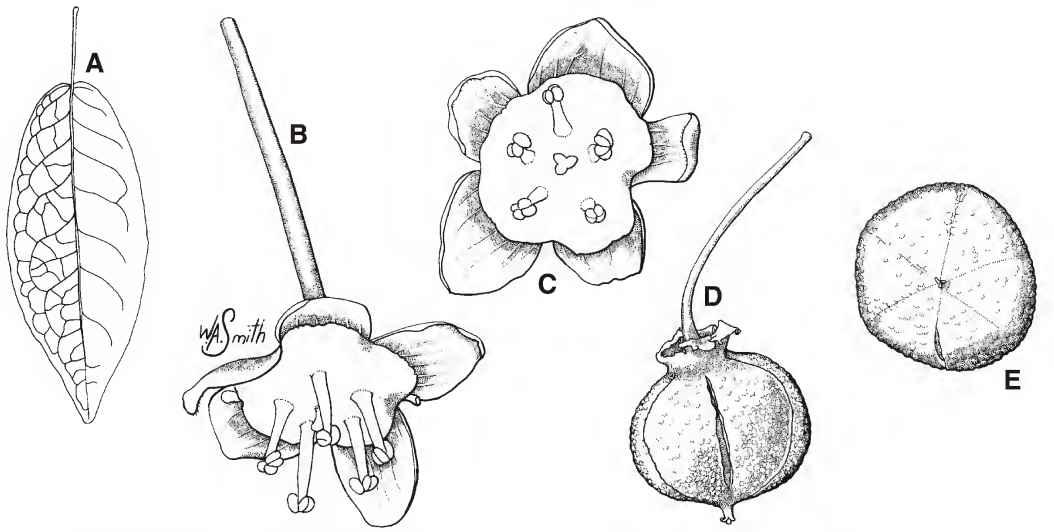


Fig. 1. ***Actephila bella.*** A. abaxial leaf surface ×1. B. side view of male flower ×6. C. face view of male flower ×6. D. side view of fruit ×4. E. face view of fruit ×4. A, D, E from *Forster PIF5859* (BRI); B, C from 27 Jan. 2004, *Tucker s.n.* (BRI). Del. W. Smith.

1. Actephila bella P.I.Forst., **sp. nov.** Ab *A. petiolari* Benth. petiolo folii cremea (versus adversum olivaceam), venis paginae abaxialis folii usque ad tantum ordine 1–2 (adversum ordines 1–4) distinguibilibus, floribus masculis pedicellis longis (13–15 × *c.* 0.8 mm) filiformibus (adversum pedicellos breves validos (3–7 × 0.6–0.8)), petalis oblongis et longioribus (2.5–3 × 0.4–0.7 mm) (non petala oblanceolata et breviora (1.8–2.5 × 0.5–1.2 mm) et disco majore (6–7.5 mm diam. adversum 3.5–6 mm diam.) differt.

Typus: Queensland. Port Curtis District: Bulburin State Forest (S.F. 67 Bulburin), *c.* 400 m NW of junction of Granite & Boobook Creeks, 24° 32'S, 151° 30'E, 17 April 1980, *W.J. McDonald 3260, W.J. Fisher & P. Ryan* (holo: BRI [2 sheets])

Actephila sp. (Granite Creek P.I.Forster PIF5859) (Forster & Henderson 1997: 70; Forster & Halford 2002: 68).

Subshrub or shrub to 3 m high. Indumentum of simple trichomes, fawn, entire plant is glabrous unless stated otherwise. Branchlets glossy, cream-fawn, sparsely lenticellate with age, glabrous or with scattered to sparse indumentum when young, glabrescent. Stipules ovate-triangular, 0.8–1.2 mm long, 0.7–1.2 mm wide, with scattered cilia. Leaves alternate, coriaceous, petiolate; petioles 3–47 mm long, 0.8–1 mm wide, cream, lenticellate, glabrous or with sparse indumentum; lamina length/petiole length ratio 2.6–18.7 (n=39); lamina elliptic-ovate, rarely obovate, ± flat, 56–145 mm long, 23–61 mm wide, length/width ratio 1.9–3.1 (n=39); base obtuse to rounded, rarely subcordate and unequal; tip acute to acuminate, rarely rounded; midrib above slightly raised (height < 5 times the width), pale green, below strongly raised at lamina base (height ± equal to width) then decreasing towards apex, pale olive-green; venation brochidodromous, comprising 10–14 lateral veins per side of midrib and intercostal reticulate veins; upper surface dark green and glossy, lateral venation visible, intercostal venation visible; lower surface pale olive-green and matt; lateral and intercostal venation prominent and slightly raised, 1° and 2° vein orders distinct, 3° and 4° vein orders indistinct, 5° and onwards vein orders obscure; margin entire, flat, pale olive-green. Inflorescence an axillary fascicle 1–1.5 mm diameter, single sex or with both male and female flowers. Male flowers: pedicels filiform, 13–15 mm long, *c.* 0.8 mm diameter; sepals 5, fused for

2.5–3 mm, lobes oblong-ovate, 2.5–3.5 mm long, 3.5–5 mm wide, glabrous or sparsely ciliate in patches towards apices; petals absent or present as one or two, oblong, 2.5–3 mm long, 0.4–0.7 mm wide; disk conspicuous, fleshy, 1.5–2 mm high, 6–7.5 mm diameter, 5-angled; stamens 3–5, filaments 2.5–3 mm long, 0.3–0.5 mm diameter, anthers 0.7–0.8 mm long, 1–1.2 mm wide. Female flowers not seen; sepals 5, oblong-ovate, *c.* 2.5 mm long, 1.8–2 mm wide; petals not seen; disk conspicuous, fleshy, *c.* 1.5 mm high, 4.5–5 mm diameter, 5-angled. Fruit: pedicels *c.* 18 mm long and 0.5 mm diameter; capsules depressed-globose to subglobose, rounded, 9–10 mm long, 12–13 mm diameter, strongly bullate, green; columella not seen. Seeds not seen. **Fig. 1.**

***Additional specimens examined*: Queensland.** Port Curtis District: SE end of Granite Creek, Bulburin S.F. 391, 24° 38'S, 151° 33'E, Oct 1989, *Forster PIF5859* (BRI, L); Bulburin Forest Reserve, Pine Creek, 24° 37'S, 151° 33'E, Jan 2004, *Forster PIF29892 & Tucker* (BRI); S.F. 67 Bulburin, Granite Creek, Jul 1978, *McDonald 2374 & Stanton* (BRI); Shoalwater Bay Training Area, *c.* 4.5 km W of Old Raspberry Vale, 22° 33'S, 150° 20'E, Sep 1993, *McDonald 5685 & Melzer* (BRI); cult. Kholo, Ipswich (ex S.F. 391 Bulburin, Pine Creek), Jan 2004, *Tucker s.n.* (BRI).

***Notes*:** *Actephila bella* shows some superficial similarities to *A. petiolaris* from nearly 5° of latitude further north, but differs from that species in the cream leaf petiole (versus olive-green), the abaxial leaf lamina surface with 1 and 2° vein orders distinct (versus 1–4° distinct); the male flowers with long (13–15 × *c.* 0.8 mm), filiform pedicels (versus short (3–7 × 0.6–0.8), stout pedicels), petals that are oblong and longer (2.5–3 × 0.4–0.7 mm) (versus petals that are oblanceolate and shorter (1.8–2.5 × 0.5–1.2 mm)) and the larger disk (6–7.5 mm diameter versus 3.5–6 mm diameter).

The floral descriptions for this species are incomplete. I have seen only two male flowers (from the Pine Creek population) and no female flowers.

***Distribution and habitat*:** *Actephila bella* is known from two 1° grid cells with populations at Shoalwater Bay and Bulburin Forest Reserve (several localities) (**Map 5**). Plants grow in the understorey of 'dry' rainforest (araucarian notophyll vineforest) on alluvium and substrates derived from andesite at altitudes between 160 and 300 m.

***Conservation status*:** *Actephila bella* is an inconspicuous plant and is likely to be overlooked by collectors. At Pine Creek (within the Bulburin Forest Reserve) this species grows in close association with the critically endangered *Macadamia jansenii* C.L.Gross & P.H.Weston. Individual numbers of the *Actephila* at this locality are not high (less than 500 plants). The number of individuals at the other two localities is not known. Further survey work is required to determine an area of occupancy and an estimation of the number of individuals; however, it is likely that the species should be listed as Endangered.

***Etymology*:** The specific epithet is formed from the Latin word *bellus* (beautiful) and refers to the flowers of this species.

2. Actephila championiae P.I.Forst., **sp. nov.** ab *A. latifoliae* Benth. differt ramulis cremeis (adversum atro-brunneos), lamina folii basi obtusa rotundata rarius infirme cordata (adversum attenuatam usque cuneatam), margine revoluto (non plano) et venis in pagina abaxiali folii usque ad tantum ordinibus 1–2 (adversum ordines 1–3) distinguibilibus, floribus foemineis petalis oblanceolatis vel oblongis vel spathulatis (non obovatis) et majoribus (3–3.2 × 1–2 mm non 1–2 × 0.5–1 mm) et discis majoribus (6–7 mm diam. adversum 3–4 mm).

Typus: Queensland. South Kennedy District: Black Mt area, 21° 36'S, 149° 10'E, 20 September 1993, *I.G. Champion 870* (holo: BRI; iso: DNA, MEL).

Actephila sp. (Koumala I.G.Champion 870) (Forster & Henderson 1997: 70; Forster & Halford 2002: 68).

Shrub or small tree to 8 m high. Indumentum of simple trichomes, uncoloured, entire plant is glabrous unless stated otherwise. Branchlets matt to slightly glossy, cream, lenticellate with age. Stipules triangular, 1.2–2 mm long, 0.8–1.3 mm wide, irregularly ciliate. Leaves alternate, rarely subverticillate, coriaceous, petiolate; petioles 10–44 mm long, 1.5–2 mm wide, green-yellow, lenticellate; lamina length/ petiole length ratio 3.6–13.2 (n=64); lamina elliptic, obovate, oblanceolate or oblong, ± flat, 65–220 mm long,

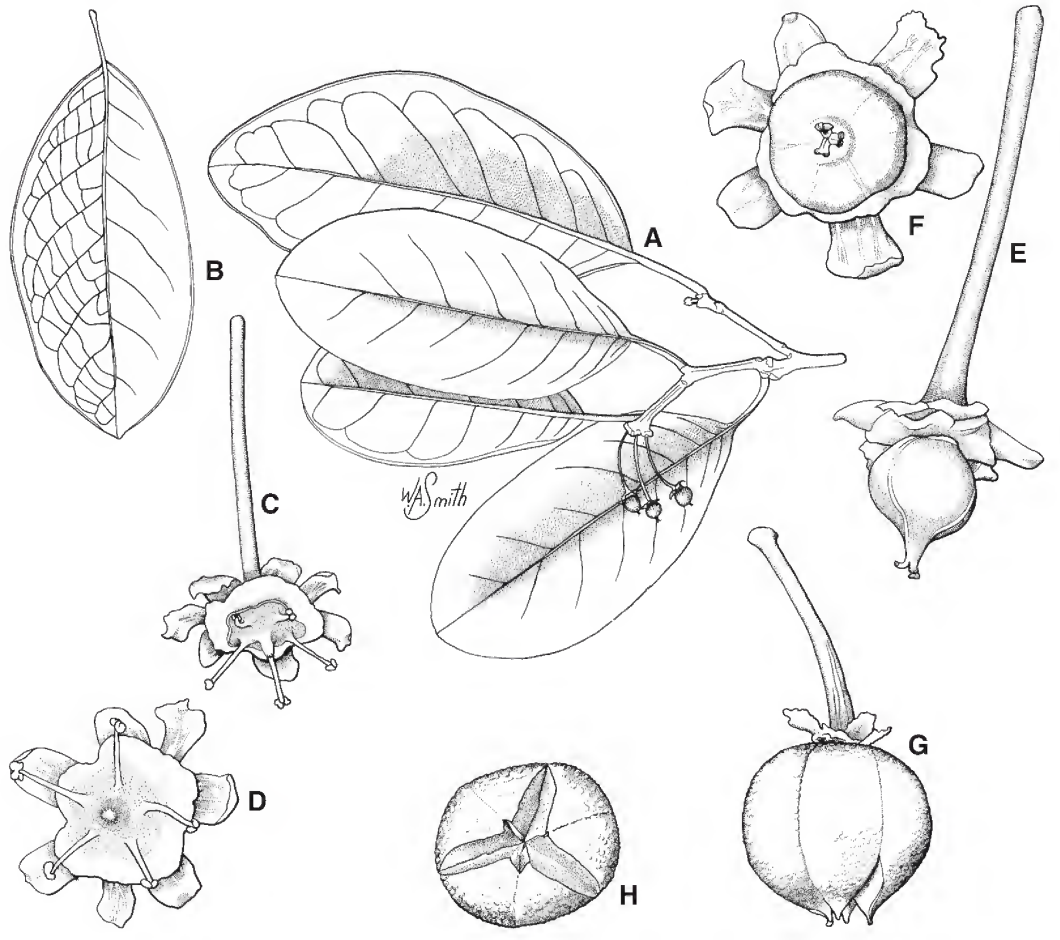


Fig. 2. ***Actephila championiae.*** A. habit of flowering branch ×0.5. B. abaxial leaf surface ×0.25. C. side view of male flower ×3. D. face view of male flower ×4. E. side view of female flower ×3. F. face view of female flower ×4. G. side view of dehiscing fruit ×1.5. H. face view of dehiscing fruit ×1.5. A, C, D-F from *Champion 870* (BRI), B, G, H from *Champion 900B* (BRI). Del. W. Smith.

12–110 mm wide, length/width ratio 1.8–2.8 (n=64); base acute to rounded, rarely weakly cordate and unequal; tip acute to rounded, rarely retuse; midrib above ± flat, dark green, below prominently raised at lamina base (height > width) then decreasing toward apex, pale yellow; venation brochidodromous, comprising 10–12 lateral veins per side of midrib and intercostal reticulate veins; upper surface dark green and glossy, lateral venation visible, intercostal venation ± obscure; lower surface pale green-yellow and matt, lateral and intercostal venation prominent, only laterals raised, 1° and 2° vein orders distinct, 3° and 4° vein orders indistinct, 5° and onwards vein orders obscure; margin entire, revolute, pale yellow. Inflorescence an axillary fascicle 3–4 mm diameter, rarely interpetiolar or on a short peduncle to 5 mm long, single sex or with both male and female flowers. Male flowers: pedicels filiform, 10–15 mm long, 0.8–1.3 mm diameter; sepals 5, oblong to obovate, fused for 2–2.5 mm at base, free lobes 2.5–4 mm long, 1.7–3 mm wide, ciliate in patch at apices; petals absent or one or two present, oblanceolate, oblong or spathulate, 3.2–4 mm long, 0.8–1.8 mm wide; disk conspicuous, fleshy, 1.5–2 mm high, 8–9 mm diameter, strongly 5–(6)-angled; stamens 5,

filaments 2.5–4 mm long, *c.* 0.2 mm diameter, anthers, 0.4–0.5 mm long, 0.6–0.8 mm wide. Female flowers: pedicels stout, 10–18 mm long, 0.8–2 mm diameter; sepals 5, obovate, fused at base for 1–1.5 mm, free lobes 2.8–3 mm long, 1.7–2 mm wide, ciliate in patch at apices; petals absent or one or two present, oblanceolate, oblong or spathulate, 3–3.2 mm long, 1–2 mm wide; disk conspicuous, fleshy, *c.* 1.5 mm high, 6–7 mm diameter, strongly 5-angled; ovary 3.5–4 mm long, 4–4.5 mm diameter; styles 3, simple, shortly connate at base, 1.7–2 mm long, stigmas subcapitate. Fruit: pedicels 12–25 mm long, 1–1.5 mm diameter; capsules depressed-globose to subglobose, rounded to weakly trilobate, 14–17 mm long, 14–20 mm diameter, weakly bullate, green; columella *c.* 9 mm long. Seeds not seen. **Fig. 2.**

***Additional specimens examined*: Queensland.** South Kennedy District: Black Mt., *c.* 7 km NW of Koumala, 21° 35'S, 149° 10'E, Dec 1993, *Champion 900a et al.* (AD, BRI, DNA); *loc. cit.*, Dec 1993, *Champion 900b et al.* (BRI); *loc. cit.*, Dec 1993, *Champion 900c et al.* (BRI, MEL, NSW); *loc. cit.*, Dec 1993, *Champion 900d et al.* (BRI); Cameron Creek, Black Mt., just N of join with rail line, *c.* 6 km NW of Koumala, 21° 55'S, 149° 25'E, Mar 1996, *Champion 1348 & Canning* (BRI, L); Cameron Creek, Black Mt., *c.* 6.3 km NW of Koumala township, 21° 55'S, 149° 25'E, Mar 1996, *Champion 1349 & Canning* (BRI, DNA, NSW); T.R. 179 Kalvin, Black Mt Range, 21° 36'S, 149° 11'E, Apr 1991, *Forster PIF8030 & McDonald* (BRI, L, MEL, QRS).

***Notes*:** *Actephila championiae* differs from *A. latifolia* Benth. in the cream branchlets (versus dark brown), the leaf lamina with a base that is obtuse to rounded, rarely weakly cordate (versus attenuate to cuneate), a margin that is revolute (versus flat), and abaxially with 1–2° of vein orders distinct (versus 1–3°); the female flowers with petals that are oblanceolate, oblong or spathulate (versus obovate) and larger (3–3.2 × 1–2 mm versus 1–2 × 0.5–1 mm) and a larger disk (6–7 mm diameter versus 3–4 mm).

Together with *A. latifolia* and *A. plicata*, *A. championiae* may comprise a natural species group with the species distributed in an allopatric geographic replacement sequence from central Queensland to the top of the 'Wet Tropics'.

***Distribution and habitat*:** *Actephila championiae* is narrowly endemic (single 1° grid cell) in central Queensland where it is restricted to the Black Mountain Range near Koumala (**Map 5**). Plants grow in the understorey of 'dry' rainforest (semi-deciduous, complex notophyll vineforest) on substrates derived from acid volcanic rocks at altitudes between 160 and 200 m.

***Conservation status*:** *Actephila championiae* is not present in any conservation reserves. Further survey work is required in the Black Mountain Range to determine an area of occupancy and estimation of the number of individuals for the species. *Actephila championiae* is currently listed as *Vulnerable* under the *NCA*.

***Etymology*:** *Actephila championiae* is named to honour Irene Champion of Mackay, in recognition of her significant contribution to the documentation and collection of the flora of central Queensland. Irene has contributed over 1300 herbarium collections to the Queensland Herbarium and made repeated visits to the habitat of this species to ensure the collection of fertile material after its initial discovery in a sterile state.

3. Actephila flavescens P.I.Forst. **sp. nov.** ab *A. lindleyi* (Steud.) Airy Shaw stipulis minoribus (0.5–0.8 × 0.5–0.8 mm) ovatis (adversum stipulas majores (1–1.7 × 0.8–1.5 mm) triangulari-ovatas), petiolis flavo-cremeis (non brunneis usque olivaceis), lamina folii margine revoluto (adversum planum usque recurvum), apice acuto (rarius acuminato) adversum apicem acutum vel rotundatum (rarius retusum), costa abaxiali manifeste emersa ad basim laminae (alto > latitudine) adversum valde emersam (alto < latitudine), flavescenti (adversum pallide flavo-viridi) et frutice majore (14–16 × 14–15 mm non 9–12 × 11–13.5 mm) et seminibus majoribus (9–11 × 7–8 mm non 6–7 × 5–6.5 mm) pallide olivaceis non atro-olivaceis differt.

Typus: Queensland. Cook District: Daintree National Park, Adeline Creek headwaters, Candlenut Scrub, 16° 07'S, 145° 03'E, 18 May 1999, *P.I. Forster PIF24571 & R. Booth* (holo: BRI; iso: QRS).

Shrub or small tree to 5 m high. Indumentum of simple trichomes, uncoloured, entire plant is glabrous unless stated otherwise. Branchlets glossy, cream, lenticellate with age. Stipules ovate, 0.5–0.8 mm long, 0.5–0.8 mm wide. Leaves alternate, subverticillate or subopposite, coriaceous, petiolate; petioles 4–12 mm long, 0.8–1.2 mm wide, cream-yellow, lenticellate with age; lamina length/petiole length ratio 6.5–23.8 (n=27); lamina oblanceolate to obovate, rarely ± falcate, ± flat, 57–120 mm long, 23–42 mm wide, length/width ratio 2–3.1 (n=27); base acute to attenuate; tip acuminate, rarely acute; midrib above strongly raised (height < width), dark green, below prominently raised at lamina base (height > width) then decreasing towards apex, pale yellow; venation brochidodromous, comprising 10 or 11 lateral veins per side of midrib and intercostal reticulate veins; upper surface dark green and glossy, lateral and intercostal venation visible; lower surface pale green, glossy, lateral venation slightly raised, intercostal venation visible and not raised, 1–3° vein orders distinct, 4° and 5° vein orders indistinct, 6° and onwards vein orders obscure or absent; margin entire, revolute, pale yellow. Inflorescence an axillary fascicle 1–3 mm diameter, rarely interpetiolar, single sex or with both male and female flowers. Male flowers not seen. Female flowers not seen at anthesis; sepals 5, oblong to ovate, 1.5–3 mm long, 0.8–1 mm wide, externally with a few scattered simple trichomes, apices cucullate, internally glabrous; petals not seen; disk conspicuous, fleshy, *c.* 1 mm high and 3 mm diameter, annular; ovary not seen; styles not seen, stigmas not seen. Fruit: pedicels 5–35 mm long, *c.* 1 mm diameter; capsules depressed-globose, rounded, 14–16 mm long, 14–15 mm diameter, strongly bullate, green; columella 7–8 mm long. Seeds 9–11 mm long, 7–8 mm wide, pale olive green; hilum *c.* 2 mm long, caruncle poorly developed, narrow-oblong, *c.* 2 mm long and 0.5 mm wide, cream.

***Additional specimens examined*: Queensland.** Cook District: Cedar Bay, 15° 47'S, 145° 21'E, Jan 1973, *Dick sub Webb & Tracey 13774* (QRS); Mt Hedley, 3 km ENE of Rossville, T.R. 165, 15° 44'S, 145° 17'E, Apr 1999, *Forster PIF24293 & Booth* (BRI, QRS); Shipton's Flat on Tin Mine road, 15° 45'S, 145° 10'E, May 1969, *Smith 14358* (BRI).

***Notes*:** This is a poorly collected species and its morphological description is incomplete. I have seen only sterile or fruiting material and collectors should seek flowers when encountering this plant. *Actephila flavescens* appears to be closely allied to *A. lindleyi* but is disjunct by 2° of latitude from populations of that species and differs in the smaller (0.5–0.8 × 0.5–0.8 mm) ovate stipules (versus larger (1–1.7 × 0.8–1.5 mm) triangular-ovate stipules); the cream-yellow petioles (versus brown to olive-green stipules); the leaf lamina with a revolute margin (versus flat to recurved), tip that is acuminate (rarely acute) versus acute or rounded (rarely retuse), the midrib abaxially prominently raised at lamina base (height > width) (versus strongly raised (height < or ± equal to width) and pale yellow (versus pale green-yellow); and the larger fruit (14–16 × 14–15 mm versus 9–12 × 11–13.5 mm) and larger seeds (9–11 × 7–8 mm versus 6–7 × 5–6.5 mm) that are pale olive-green (versus dark olive green).

Actephila flavescens appears to form a natural species group with *A. grandifolia, A. lindleyi, A. traceyi, A. venusta* and *A. vernicosa*, with all of these species being geographically allopatric.

***Distribution and habitat*:** *Actephila flavescens* is known from a restricted area (single 1° grid cell) in the 'Wet Tropics' of north-eastern Queensland between Mt Hedley and Adeline Creek (**Map 2**). Plants have been collected from 'dry' rainforest (semideciduous, complex notophyll vineforest) on substrates derived from granite at altitudes between 480 and 540 m

***Conservation status*:** *Actephila flavescens* is present in the Daintree National Park and Timber Reserve 165. At Mt Hedley and Adeline Creek plants were locally common, but no attempt was made at the time to determine population sizes. Further survey is required of suitable habitats within the known distribution area to determine an area of occupancy and estimation of the number of individuals for the species. It is likely that *A. flavescens* is not currently threatened.

***Etymology*:** The specific epithet is derived from the Latin adjective *flavescens* (yellowish, pale yellow) and refers to the prominent leaf lamina midrib of this species (when compared to *A. lindleyi*) as viewed from below.

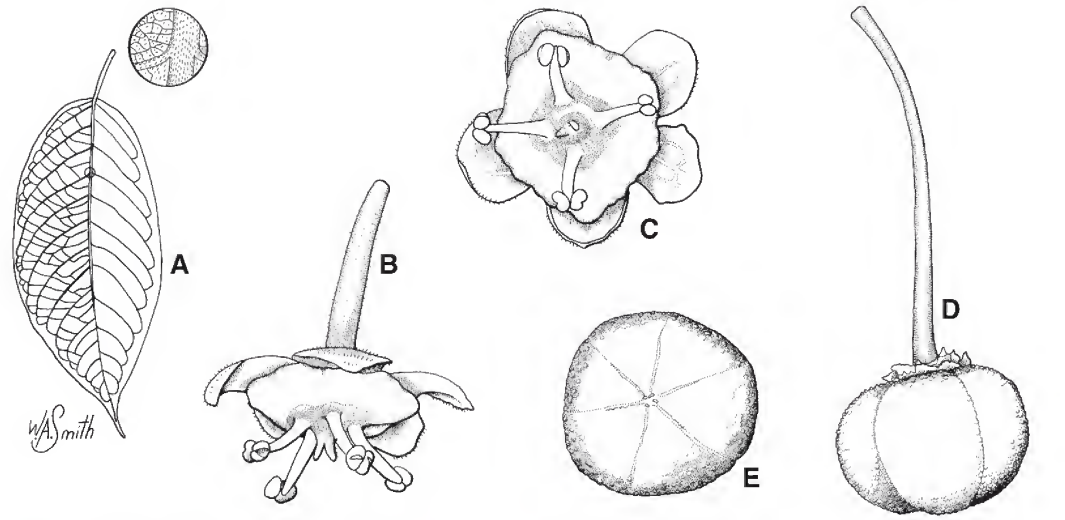


Fig. 3. *Actephila foetida.* A. abaxial leaf surface with detail of indumentum ×0.25. B. side view of male flower ×6. C. face view of male flower ×7. D. side view of fruit ×1.5. E. face view of fruit ×1.5. A-C from *Forster PIF28216* (BRI); D, E from *Jago 6004* (BRI). Del. W. Smith.

---

4. Actephila foetida Domin, *Biblioth. Bot.* 89: 315 (1927). **Type:** Queensland. Cook District: in hygrodrymio apud rivulum Harveys Creek, distr. Cairns, December 1909, *K. Domin 5839* (lecto [here designated]: PR528400).

***Illustrations*:** Hyland *et al.* (1999, 2003).

Subshrub to 1 m tall. Indumentum of simple trichomes, pale fawn. Branchlets glossy, fawn, densely pubescent when young, glabrescent and lenticellate with age. Stipules triangular, 1–2.2 mm long, 1.5–2 mm wide, with scattered to dense indumentum. Leaves alternate, chartaceous, petiolate; petioles 18–78 mm long, 1–5 mm wide, dark olive-green, with dense indumentum when young, glabrescent and lenticellate; lamina length/petiole length ratio 2.8–12.8 (n=21); lamina broadly elliptic to obovate, ± flat, 45–530 mm long, 30–213 mm wide, length/width ratio 1.9–2.7 (n=21); base cordate to truncate; tip obtuse to long acuminate; midrib above ± flat, dark olive-green, below prominently raised at lamina base (height > width) then decreasing towards apex, dark olive-green; venation brochidodromous, comprising 12–15 lateral veins per side of midrib and intercostal reticulate veins; upper surface dark olive-green, lateral venation visible, intercostal venation ± obscure, glabrous or with an occasional trichome on the midrib; lower surface pale olive-green, lateral venation prominent and raised, intercostal venation prominent but not raised, 1–4° vein orders distinct, 5° vein order indistinct, 6° and onwards vein orders obscure, with sparse, hispid indumentum, apart from on the lateral veins where it may be dense; margin entire, flat, pale olive-green. Inflorescence an axillary fascicle 7–13 mm diameter, with both male and female flowers. Male flowers: pedicels filiform, 3.5–8 mm long, 0.5–0.7 mm diameter, with sparse, hispid indumentum; sepals 5, lanceolate-ovate to obtuse-ovate, 2–2.5 mm long, 1–1.8 mm wide, ciliate, with sparse indumentum externally, glabrous internally; petals absent; disk conspicuous, fleshy, *c.* 1 mm high, 3.5–4 mm diameter, irregularly 4 or 5-angled; stamens 4 or 5, filaments 1.3–1.8 mm long, *c.* 0.2 mm diameter, glabrous, anthers globose-ovoid, *c.* 0.4 mm long, 0.3–0.4 mm wide. Female flowers: pedicels filiform, 7.5–9 mm long, 0.5–0.7 mm diameter, with sparse, hispid indumentum; sepals 5, obovate, 3–4 mm long, 2–2.8 mm wide, ciliate, with sparse indumentum externally, glabrous internally; petals absent; disk conspicuous, fleshy, *c.* 1 mm high, 4–4.5 mm diameter, irregularly 4 or 5 angled; ovary 1.4–1.8 mm long, 1.8–2 mm diameter, with dense indumentum; styles 3, simple, *c.* 1 mm long, stigmas subcapitate. Fruit: pedicels 7–35 mm long, 1–2 mm diameter,

glabrous; capsules depressed-globose, rounded to weakly trilobate, 12–13 mm long, 15–19 mm diameter, strongly bullate; columella 3.5–7 mm long. Seeds 8–10 mm long, 7–12 mm wide, hilum 1.5–2 mm long, caruncle poorly developed, narrow-oblong, 2.3–3 long, 0.3–0.8 mm wide, cream. **Fig. 3.**

***Additional specimens examined*: Queensland.** Cook District: 8 km from Bellenden Ker, 17° 16'S, 145° 55'E, Dec 1992, *Bruhl 1022 et al.* (BRI, QRS); Harveys Creek, Jan 1910, *Domin 3410* (PR); *loc. cit.*, Dec 1909, *Domin 5838* (PR – residual syntype); Bellenden Ker cable car Base Station, 17° 16'S, 145° 54'E, Jan 2002, *Forster PIF28216 et al.* (BRI); adjacent to Bellenden Ker Primary School, 17° 16'S, 145° 55'E, Nov 1994, *Gray 5844, 5845* (QRS); *loc. cit.*, Dec 1994, *Gray* 5881 (QRS); N.P.R. 226 (Harvey Creek), 17° 15'S, 145° 50'E, Jan 1972, *Hyland 5788* (BRI, QRS); adjacent to Bellenden Ker State School on Harvey Creek road, 17° 17'S, 145° 55'E, Mar 1981, *Irvine 2092, 2094* (QRS); Harveys Creek, Bellenden Ker, Dec 1991, *Jago C3694* (BRI); Parish of Bellenden Ker, Local Gov. Res. 806 & part of adjoining road reserve, 17° 16'S, 145° 55'E, Jun 1985, *Lyons 2* (BRI); *loc. cit.*, Dec 1985, *Lyons 5* (QRS); Hutchinson's Creek, Cow Bay, 16° 13'S, 145° 24'E, Oct 1996, *Small 5* (QRS); Harvey Creek, Russell River, 1887, *Sayer s.n.* (MEL); Bellenden Ker, 17° 17'S, 145° 54'E, Mar 1981, *Stocker 1782* (QRS).

***Distribution and habitat*:** *Actephila foetida* has a restricted distribution in the Wet Tropics of north-eastern Queensland with two centres of distribution in adjacent 1° grid cells: the vicinity of the township of Bellenden Ker near and along Harvey Creek and north of the Daintree River at Hutchinson Creek (**Map 4**). Plants occur as understorey shrubs in 'wet' lowland rainforest (evergreen, complex mesophyll vineforest) on alluvium overlying granite substrates at altitudes from near sea level to 100 m.

***Typification*:** The protologue for *Actephila foetida* states "Nordost-Queensland: Regenwälder bei Harveys Creek (DOMIN XII.1909)". There are three collections of this species by Domin at PR, one (PR528398: fruiting) was collected in January 1910, the other two (PR528399 & PR528400: both flowering) in December 1909. The better of these two (PR528440) has three complete leaves and both male flowers and fruiting peduncles and is selected here as lectotype of the name.

***Notes*:** *Actephila foetida* is poorly known in terms of the potential variation in its morphology due to a paucity of fertile collections. It is a highly distinctive species due to the large leaves (generally between 20 and 35 cm long) that are covered in hispid indumentum on the lower lamina surface and the flowers that lack petals and that have hispid indumentum on the pedicels and the calyx. Airy Shaw (1981) described the fruit of this species as 5-6 mm long, but these measurements must have been taken from immature material.

The population at Hutchinson's Creek lacks comprehensive fertile collections, but appear to have sparser indumentum on the foliage than those from Harvey Creek.

***Conservation status*:** *Actephila foetida* is currently listed as *Vulnerable* under the *NCA*. Populations are present in Daintree and Wooroonooran National Parks. There is no accurate information about the area of occupancy for the species or the number of individuals that exist. The species is locally common at the base of Bellenden Ker and along Harvey Creek.

***Etymology*:** The specific epithet is formed from the Latin word *foetidus* (stinking, evil smelling) and refers to the smell of the male flowers.

5. Actephila grandifolia (Müll.Arg.) Baill., *Adansonia* 6: 330 (1866).

Lithoxylon grandifolium Müll.Arg., *Linnaea* 34: 65 (1865). **Type:** New South Wales. ("Nouvelle Hollandia"), Clarence River, *F. Mueller s.n.* (holo: G-DC [photo at BRI!]

***Illustration*:** Baillon (1866b: t. 10).

Subshrub or shrub to 3 m high. Indumentum of simple or pustular-glandular trichomes, uncoloured to pale ferruginous, entire plant is glabrous unless stated otherwise. Branchlets glossy, tan, lenticellate with age, glabrous or with scattered to sparse pustular-glandular trichomes, glabrescent. Stipules triangular to triangular-ovate, 0.8–2 mm long, 0.7–1.5 mm wide. Leaves alternate, subverticillate or subopposite, coriaceous, petiolate; petioles 3–30 mm long, 0.8–2 mm wide, cream, lenticellate with age; lamina length/petiole length ratio 4.3–18 (n=184); lamina oblanceolate to obovate, rarely narrow-elliptic, often weakly falcate, ± flat, 31–240 mm long, 10–64 mm wide, length/width ratio 2.3–5.8 (n=184); base acute,

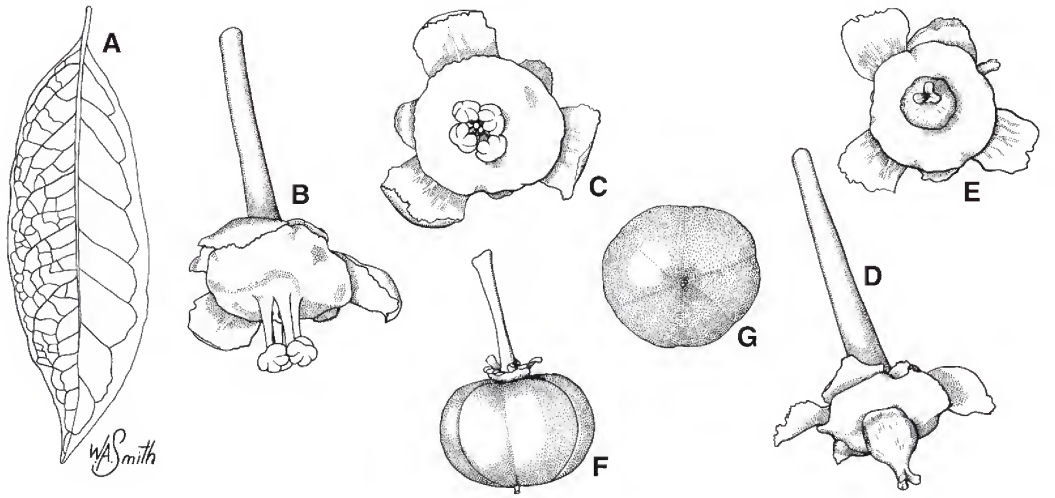


Fig. 4. ***Actephila grandifolia***. A. abaxial leaf surface ×0.5. B. side view of male flower ×4. C. face view of male flower ×4. D. side view of female flower ×4. E. face view of male flower ×4. F. side view of fruit ×1.5. G. face view of fruit ×1.5. A, F, G from *Forster PIF25276* (BRI); B-E from *Forster PIF25283* (BRI). Del. W. Smith.

acuminate, attenuate or cuneate, often unequal; tip acute or acuminate, rarely retuse, rounded or truncate; midrib above slightly raised (height < 5 times the width), pale yellow, below strongly raised at lamina base (height < or ± equal to width) then decreasing towards apex, pale green-yellow; venation brochidodromous, comprising 7–14 lateral veins per side of midrib and intercostal reticulate veins; upper surface dark green and glossy, lateral and intercostal venation visible; lower surface pale green, matt-glaucous, often drying brown, lateral venation slightly raised, intercostal venation visible and slightly raised, 1–3° vein orders distinct, 4° and 5° vein orders indistinct, 6° and onwards vein orders obscure; margin entire to slightly wavy or undulate, recurved, pale green-yellow. Inflorescence an axillary fascicle 2–4 mm diameter, single sex or with both male and female flowers. Male flowers: pedicels filiform, 10–20 mm long, 0.1–0.4 mm diameter; sepals 5, obovate, 2–3.5 mm long, 1.8–3 mm wide, apices with a dense patch of hairs internally, ciliate and with scattered hairs towards base externally; petals absent, or one to three present, oblong to spathulate, 1.4–1.5 mm long, 0.5–0.7 mm wide, irregularly bidentate; disk conspicuous, fleshy, 0.8–1 mm high, 3–5 mm diameter, annular, white; stamens 3 or 4, filaments 2.2–4.5 mm long, 0.1–0.2 mm diameter, anthers globose-ovoid, 0.5–0.6 mm long, 0.7–0.8 mm wide. Female flowers: pedicels filiform, 7–28 mm long, 0.4–0.5 mm diameter, glabrous or with scattered, uncoloured simple trichomes; sepals 5, obovate, 2.2–3 mm long, 1–2 mm wide, apices internally densely ciliate, with scattered to sparse trichomes towards base externally; petals absent or one or two present, oblong to spathulate, 1–1.5 mm long, 0.5–0.8 mm wide; disk conspicuous, fleshy, 0.8–1 mm high, 2.5–5 mm diameter, annular; ovary 1–3 mm long, 1.2–3 mm diameter; styles 3, simple, shortly connate at base, 0.8–1 mm long, stigmas subcapitate. Fruit: pedicels 7–28 mm long, 0.5–1 mm diameter; capsules depressed-globose, rounded, 9–11 mm long, 12–15 mm diameter, strongly bullate, green; columella 5–8 mm long. Seeds 6–9.5 mm long, 5–8.5 mm wide, dark olive green with irregular darker green blotches; hilum 2.5–3.5 mm long, caruncle poorly developed, narrow-oblong, 1–2.5 mm long, 0.2–0.3 mm wide, cream. **Fig. 4.**

***Selected specimens examined*: Queensland.** Moreton District: Lyrebird road, Springbrook, 28° 11'S, 153° 15'E, *s.dat.*, *Davidson s.n.* (BRI [AQ440657]); Camp Eden, Currumbin Valley, 28° 14'S, 153° 21'E, Dec 1997, *Forster PIF22023 & Leiper* (BRI, DNA, NE, QRS); Springbrook, Lyre Bird Ridge road, 28° 11'S, 153° 15'E, Jan 2000, *Forster PIF25276 & Leiper* (BRI, K, L, MEL, QRS); Springbrook, Repeater Station road to

Best of All Lookout, 28° 13'S, 153° 15'E, Jan 2000, *Forster PIF25283* (A, AD, BRI, K, L, MEL, NSW, QRS); Upper Currumbin Creek, 2 km ESE of Boyd's Butte, Aug 1976, *McDonald 1497 & Whiteman* (BRI, CANB). **New South Wales.** Bexhill, 28° 46'S, 153° 21'E, Feb 1891, *Baker 120* (NSW); Mullumbimby, 28° 33'S, 153° 30'E, Jun 1894, *Baker s.n.* (NSW239914, 239915); 6 km NW of Bangalow, 28° 31'S, 153° 28'E, Jan 1984, *Beesley 89* (CANB); 3 km W of Burringbar, 28° 27'S, 153° 26'E, Jan 1984, *Beesley 101* (CANB); Richmond River, Aug 1884, *Betche s.n.* (NSW239763); Rocky Creek, Whian Whian S.F., 17.6 km NNE of Lismore, 28° 39'S, 153° 20'E, Sep 1972, *Coveny 4446 & Rodd* (BRI, NSW); Big Scrub Reserve on Rocky Creek, Whian Whian S.F., 4.8 km NNE of Dunoon, 28° 38'S, 153° 20'E, Jan 1980, *Coveny 10597 & Hind* (BRI, NSW); Upper Crystal Creek, 28° 16'S, 153° 18'E, May 1977, *Floyd AGF347* (CANB); Hill 1 km E of Mooball, 28° 27'S, 153° 30'E, Jul 1981, *Guymer 81038 & Harden* (NSW); Richmond River, Sep 1867, *Henderson 58* (MEL); Red Scrub, Whian Whian, 28° 34'S, 153° 21'E, Feb 1967, *Jones 3469* (CANB); Tintenbar, 28° 48'S, 153° 31'E, Oct 1894, *Maiden s.n.* (NSW239894); Eureka, Richmond River, 28° 40'S, 153° 26'E, Jul 1915, *Rupp s.n.* (MEL47993); Whian Whian S.F., Big Scrub F.R., 28° 38'S, 153° 20'E, Jun 1986, *Shapcott s.n.* (BRI [AQ451831]); Marshall Falls, Alstonville, 28° 50'S, 153° 26'E, Sep 1911, *Tanner s.n.*(NSW239853); Red Scrub, Whian Whian S.F., 28° 38'S, 153° 17'E, Aug 1974, *Webb & Tracey 11456* (BRI).

***Distribution and habitat*:** *Actephila grandifolia* has a restricted distribution in south-eastern Queensland and north-eastern New South Wales where it is known from a single 1° grid cell with a northern limit at Springbrook and a southern limit at Alstonville (**Map 5**). Plants grow in the understorey of subtropical 'wet' rainforest (complex notophyll vineforest) or in open forest dominated by eucalypts and with a scrubby rainforest understorey. Substrates are soils derived from basalt at altitudes between 40 and 950 m.

***Notes*:** *Actephila grandifolia* occurs in the wetter rainforests (evergreen, complex notophyll vineforest) of the Springbrook Plateau and extreme north-east of New South Wales. It is ecologically allopatric with *A. lindleyi,* although the distance between populations of the two species may not be great. The differences between *Actephila grandifolia* and *A. lindleyi* (as *A. mooreana*) were eloquently outlined by Baillon (1866b) together with a particularly detailed plate of the former. *Actephila grandifolia* was lumped into the synonymy of *A. lindleyi* by Airy Shaw (1971) and as a result disappeared from botanical view for the last 30 years (e.g. Stanley 1983; James & Harden 1990; Forster *et al.* 1991; Forster & Henderson 1997; Hauser & Blok 1998; Forster & Halford 2002), despite being recognised in herbaria (BRI, NSW) prior to this. Airy Shaw must have had second doubts about this placement, as in 1974 he determined specimens in MEL as *A. cf. grandifolia.*

Actephila grandifolia is easily distinguished from *A. lindleyi* by the leaves with cream petioles (versus brown to olive-green), the foliage being noticeably matt-glaucous below (versus glossy) and the male flowers with much longer, filiform pedicels (10–20 × 0.1–0.4 mm versus 1.5–5 × 0.2–0.8 mm), obovate sepals (versus oblong to ovate) and smaller petals (1.4–1.5 versus 2–2.5 mm long).

A chromosome count of 2n = 40 was recorded for material of *A. grandifolia* collected near "Lismore" (probably the Whian Whian S.F. collection cited above) (Shapcott 1998). On the basis of several morphological and chromosome characters Shapcott (1998) clearly distinguished her "Lismore" population from three populations of *A. lindleyi sensu stricta.* However, this was not the case with electrophoretic data where the "Lismore" population was indistinguishable from the *A. lindleyi* populations at "Mt Glorious" and "Biggenden".

***Conservation status*:** *Actephila grandifolia* is present in Springbrook National Park in Queensland and Whian Whian State Forest in New South Wales. Plants are usually locally common within a population. No information is available on the area of occupancy for each population, or the numbers of plants within individual populations.

This species (as "*A. lindleyi*") is used as a nest site in the Richmond Range of north-eastern New South Wales by the yellow-throated scrubwren *Sericornis citreogularis,* the nests of that species then being used by the golden-tipped bat *Kerivoula papuensis* as a roost site (Schulz 2000). This bird and bat use a range of other species, so it is likely that the use of the *Actephila* is related to abundance and habit within the site and conservation of the animals is not dependent on this particular plant species.

***Etymology*:** The specific epithet is formed from the Latin words *grandis* (large) and *–folius* (leaved) and alludes to the size of the leaves in this species when compared to *A. lindleyi.*

6. Actephila latifolia Benth., *Fl. Austral.* 6: 89 (1873). **Type:** Queensland. Cape York, *Daemel s.n.* (lecto: K [photo at BRI!], *fide* Airy Shaw (1981: 587)).

Actephila sp. (Little Mossman BH13697) (Hyland *et al.* 1999, 2003).

***Illustrations*:** Hyland *et al.* (1999, 2003).

Subshrub or shrub to 3 m high. Indumentum of simple trichomes, uncoloured, entire plant is glabrous unless stated otherwise. Branchlets glossy, dark brown, lenticellate with age. Stipules triangular, 1.5–2 mm long, 0.8–1.2 mm wide. Leaves alternate to subverticillate, coriaceous, petiolate; petioles 3–20 mm long, 1–2 mm wide, olive green, occasionally lenticellate; lamina length/petiole length ratio 10.8–22.5 (n=104); lamina elliptic, narrow-elliptic or oblanceolate, rarely obovate or orbicular, ± flat, 40–220 mm long, 16–80 mm wide, length/width ratio 1.9–4.2 (n=104); base attenuate to cuneate; tip acute, obtuse or rounded; midrib above slightly raised (height < 5 times the width), dark green, below prominently raised at lamina base (height > width) then decreasing towards apex, green-yellow; venation brochidodromous, comprising 10–14 lateral veins per side of midrib and intercostal reticulate veins; upper surface dark green and matt, lateral venation barely visible, intercostal venation obscure; lower surface olive green and matt, lateral venation prominent and slightly raised, intercostal venation visible but not raised, 1–3° vein orders distinct, 4° vein order indistinct, 5° and onwards vein orders obscure; margin entire, flat, green-yellow. Inflorescence an axillary fascicle 3–5 mm diameter, single sex or with both male and female flowers. Male flowers: pedicels filiform, 2.5–7.5 mm long, 0.8–1 mm diameter; sepals 5, obovate to ovate, 2–3 mm long, 1.2–1.8 mm wide, apices cucullate and densely ciliate; petals absent, or rarely present as a single one, obovate, *c.* 1.5 mm long and 0.8 mm wide, irregularly bidentate; disk conspicuous, fleshy, 0.8–1 mm high, 2.5–4 mm diameter, 5-angled; stamens 3–5, filaments 1.2–2.5 mm long, *c.* 0.1 mm diameter, anthers globose-ovoid, 0.3–0.5 mm long, 0.5–0.7 mm wide. Female flowers: pedicels filiform, 5–7 mm long, 0.8–1 mm diameter; sepals 5, obovate to ovate, 2–2.5 mm long, 1.5–1.8 mm wide, apices pouched and densely ciliate; petals absent or rarely present as a single one, obovate, 1–2 mm long, 0.5–1 mm wide; disk conspicuous, fleshy, 0.8–1 mm high, 3–4 mm diameter, 5 or 6-angled; ovary 2–2.5 mm long, 2–3 mm diameter; styles 3, simple, shortly connate at base, 0.8–1 mm long, stigmas subcapitate. Fruit: pedicels 2–32 mm long, 0.8–1 mm diameter; capsules depressed-globose, rounded, 12–14 mm long, 14–17 mm diameter, strongly bullate, green; columella 6–7 mm long. Seeds 8–9 mm long, 5.5–6.5 mm wide, olive green with irregular dark green blotches; hilum 1.4–3 mm long, caruncle poorly developed, narrow-oblong, 2–3 mm long, 0.8–1 mm wide, cream. **Fig. 5.**

***Additional specimens examined*: Queensland.** Cook District: N.P.R. 142, summit of Mt Cook, 15° 29'S, 145° 16'E, Feb 1992, *Fell DGF2416 et al.* (QRS); Mt Perserverence road, near Nissen Creek via Julatten, 16° 33'S, 145° 20'E, Feb 2003, *Ford 3838 & Holmes* (BRI, QRS); Bridle L.A., S.F. 607 Dinden, 16° 58'S, 145° 35'E, Jul 1994, *Forster PIF15486 et al.* (BRI, QRS); Bridle L.A., S.F. 607 Dinden, 16° 58'S, 145° 36'E, Jul 1994, *Forster PIF15491 et al.* (BRI, QRS); Lake Morris, Copperlode Dam, 16° 59'S, 145° 39'E, Dec 1999, *Forster PIF25217 & Booth* (BRI, MEL, QRS); S.F. 607 Dinden, Bridle Creek track, 16° 59'S, 145° 36'E, Jan 2002, *Forster PIF28120 et al.* (A, AD, BISH, BRI, MEL, MO, NE, NSW, NY, Z); Currunda Creek, Redlynch, 7 km W of Cairns, 16° 55'S, 145° 40'E, Dec 2003, *Forster PIF29786 & Jensen* (A, BRI, L, MEL, NSW, Z); S.F.R. 141, Little Mossman L.A., 16° 33'S, 145° 22'E, Jun 1995, *Gray 6238, 6239* (QRS); Special Purposes Reserve, near Lake Placid, 16° 52'S, 145° 40'E, Nov 1991, *Jago 737* (QRS); Moores Gully, 16° 48, 145° 40'E, Nov 1987, *Sankowsky 756 & Sankowsky* (BRI); cult. Tolga (ex Rex Range), Dec 2004, *Sankowsky 2553 & Sankowsky* (BRI); Mt Stuckey area, NW of Starke Station, 14° 56'S, 145° 03'E, Sep 1974, *Tracey 14295* (BRI); Macalister Range, 16° 50'S, 145° 40'E, Dec 1999, *Wannan 865 & Jago* (NSW); Smithfield – Black Mt road, via Kuranda, 1962, *Webb & Tracey 7269A* (BRI); Mt Stuckey, W of Starcke Station, 14° 56'S, 145° 03'E, Sep 1974, *Webb & Tracey 13789* (BRI).

***Distribution and habitat*:** *Actephila latifolia* is endemic to north-eastern Queensland over three 1° grid cells in the 'Wet Tropics' bioregion with a northern limit at Mt Stuckey and a southern limit at Bridle Creek and Lake Morris (**Map 5**). Although the type collection is labelled as 'Cape York' it is unlikely that it was made

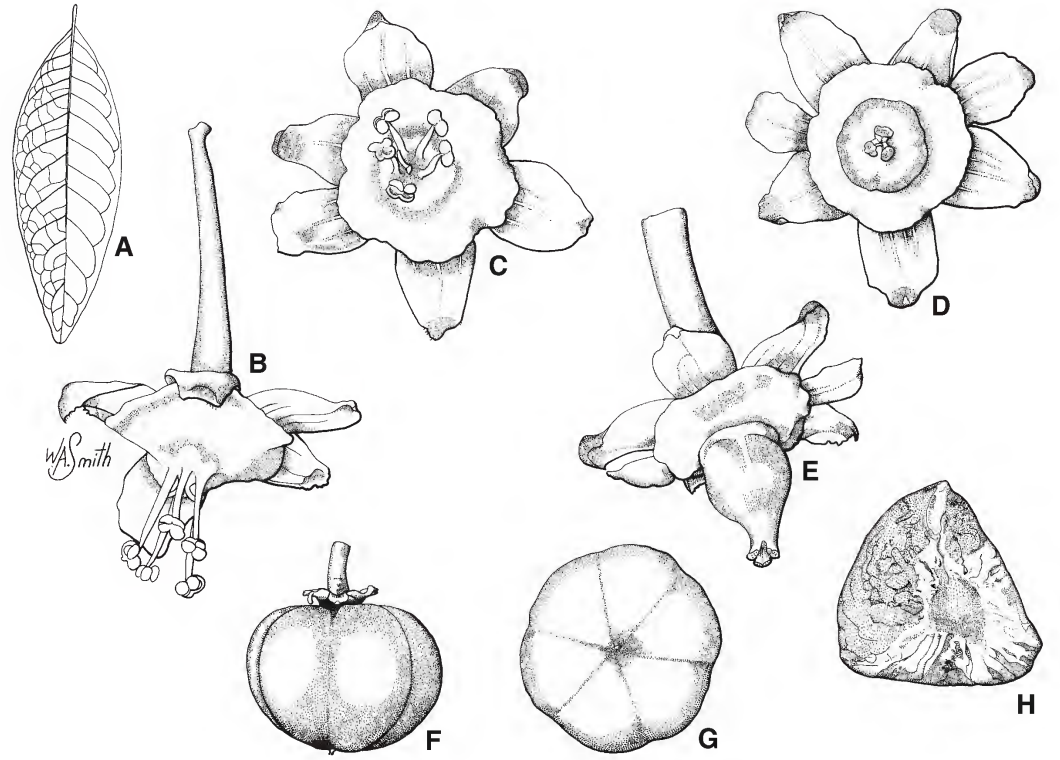


Fig. 5. ***Actephila latifolia.*** A. abaxial leaf surface ×0.25. B. side view of male flower ×6. C. face view of male flower ×6. D. side view of female flower ×6. E. face view of female flower ×6. F. side view of fruit ×1.5. G. face view of fruit ×1.5. H. ventral view of seed ×3. A, F-H from *Forster PIF15491* (BRI), B-E from *Forster PIF29786* (BRI). Del. W. Smith.

from the Cape of that name, but rather from somewhere in the vicinity of Cooktown at the southern end of Cape York Peninsula. Plants grow at altitudes between 200 and 500 m, in 'seasonally dry' rainforest (complex mesophyll or complex notophyll vineforests) on alluvial or rocky substrates derived from basalt, granite, metamorphics or mudstone.

***Notes*:** *Actephila latifolia* is a distinctive plant that appears closely allied to the more southerly distributed *A. championiae* and *A. plicata.* These species share the characteristics of leaves that are pale green-yellow to olive green below, but differ in a number of characters, such as leaf shape, lamina venation and fruit shape.

As noted previously (Forster 2004), *Actephila latifolia* has been misidentified for some time as an undescribed species (Hyland *et al.* 1999, 2003).

***Conservation status*:** *Actephila latifolia* is present in Mt Cook and Starcke National Parks, Jumrum Creek Conservation Park and State Forests 141, 607, 1229. It is not considered rare or threatened and none of the known populations are under direct anthropogenic threat. There is no information available on the area of occupancy or the number of individuals within populations.

***Etymology*:** The specific epithet is derived from the Latin words *latus* (broad, wide) and *-folius* (leaved) and alludes to the size and shape of the leaves.

7. Actephila lindleyi (Steud.) Airy Shaw, *Kew Bull.* 25: 496 (1971).

[*Securinega nitida auct.* Lindl., *non* Willd.; *Collect. Bot.* t. 9 (1821)]

Lithoxylon lindleyi Steud., *Nomenclat. Bot.*, ed. 2, 2: 57 (1841), *nom. nov.* **Type:** Cult. in Hort. Kew, "Nat. of Otaheite" [exact origin unknown], 1813–1821 (holo: K [photo at BRI!]).

Lithoxylon nitidum Baill., *Ét. Gén. Euphorb.* 590 (1858), *nom. illegit., superfl.*

Actephila nitida (Baill.) Benth. & Hook.f. ex Drake del Castillo, *Illustr. insul. Maris Pacific* 177 & 286 (1892), *nom. illegit., superfl.*

Actephila mooreana Baill., *Adansonia* 6: 330, 366 (1866). **Type:** New South Wales. Mount Lindsay, Richmond River, 1851, *C. Moore 211* (holo: P [photo at BRI!]

***Illustrations*:** Floyd (1989: 134); James & Harden (1990: 393); Hauser & Blok (1998: 145).

Shrub or small tree to 6 m high. Indumentum of simple trichomes, uncoloured to pale ferruginous, entire plant is glabrous unless stated otherwise. Branchlets glossy, cream to tan-yellow, lenticellate with age. Stipules triangular-ovate, 1–1.7 mm long, 0.8–1.5 mm wide. Leaves alternate, subverticillate or subopposite, coriaceous, petiolate; petioles 2–24 mm long, 1–2 mm wide, brown to olive-green, lenticellate with age; lamina length/petiole length ratio 5.1–22.7 (n=218); lamina elliptic-oblong, oblanceolate or obovate, rarely ± falcate, ± flat, 30–172 mm long, 12–64 mm wide, length/width ratio 1.6–3.7 (n=218); base acute to attenuate; tip acute to rounded, rarely retuse; midrib above slightly raised (height < 5 times the width), dark green, below strongly raised at lamina base (height < width) then decreasing towards apex, pale green-yellow; venation brochidodromous, comprising 7–12 lateral veins per side of midrib and intercostal reticulate veins; upper surface dark green and glossy, lateral and intercostal venation visible; lower surface pale green-yellow, glossy, often drying pale brown, lateral venation slightly raised, intercostal venation visible and slightly raised, 1–3 (rarely 4)° vein orders distinct, 4° and 5 (rarely 6)° vein orders indistinct, 6 (rarely 7)° and onwards vein orders obscure; margin entire to slightly wavy or undulate, flat to recurved (rarely revolute), pale yellow. Inflorescence an axillary fascicle 1–4 mm diameter, rarely interpetiolar, single sex or with both male and female flowers. Male flowers: pedicels filiform, 1.5–5 mm long, 0.2–0.8 mm diameter; sepals 5 (rarely 6), oblong to ovate, 1-3 mm long, 1.2–1.5 mm wide, apices cucullate, ciliate internally; petals absent, or 1–5, linear-oblong to oblong-spathulate, 2–2.5 mm long, 0.8–1.3 mm wide, rarely ciliate; disk conspicuous, fleshy, 0.4-1 mm high, 1.2–3.5 mm diameter, rounded, yellow; stamens 4 or 5, filaments 1–3 mm long, 0.1–0.2 mm diameter, anthers globose-ovoid, 0.3–0.6 mm long, 0.4–0.8 mm wide. Female flowers: pedicels filiform, 2–14 mm long, 0.4–1 mm diameter, glabrous or with scattered to sparse, uncoloured to pale ferruginous simple trichomes; sepals 5, oblong to ovate, 1–3 mm long, 0.5–1.5 mm wide, apices cucullate, internally densely ciliate; petals absent or 1–3, linear-oblong to oblong-spathulate, 0.8–2.5 mm long, 0.3–1.5 mm wide; disk conspicuous, fleshy, 0.5–1 mm high, 2–4 mm diameter, annular to 5-angled, glabrous, rarely with scattered trichomes; ovary 0.8–2.5 mm long, 1.2–2.5 mm diameter; styles 3, simple, shortly connate at base, 0.5–1 mm long, stigmas subcapitate. Fruit: pedicels 3–25 mm long, 0.6–1.2 mm diameter; capsules depressed-globose, ovoid or rounded, 9–12 mm long, 11–13.5 mm diameter, strongly bullate, olive-green; columella 5–7 mm long. Seeds 6–7 mm long, 5–6.5 mm wide, dark olive green; hilum 2–3 mm long, caruncle poorly developed, ± obscure or narrow-oblong, 1–1.5 mm long, *c.* 0.2 mm wide, cream. **Fig. 6.**

***Selected specimens examined*: Queensland.** North Kennedy District: Hervey Range, off Hervey Range road, W of Townsville, Sep 1995, *Cumming 13728* (BRI). South Kennedy District: Eastern side of Spencer Gap, Peak Downs Highway, SW of Eton, 21° 20'S, 148° 56'E, Nov 1989, *McDonald 4428 et al.* (BRI, NSW, QRS). Port Curtis District: Lower reaches of Koolkoorum Creek, 24° 25'S, 151° 12'E, Dec 1993, *Forster PIF14262* (A, BRI, L, MEL, QRS). Burnett District: S.F. 95, 20 km WSW of Gayndah, 25° 42'S, 151° 25'E, Mar 1999, *Forster PIF24166 & Booth* (AD, BRI, K, L, MEL, NSW, QRS); Kirbys road, Bundaberg, 24° 49'S, 152° 23'E, Sep 1999, *Forster PIF24918 & Schmitt* (BRI); Goodnight Scrub National Park, 25° 14'S, 151° 54'E, Jan 2004, *Forster PIF29902 & Tucker* (BRI, MEL, NSW). Wide Bay District: Council Beauty Spot, 1 km E of Mt Cooroy, 26° 26'S, 152° 58'E, Nov 1990, *Forster PIF7587 & Sharpe* (BRI, L, QRS); Utopia, 14 km SSE of Biggenden, 25° 38'S, 152° 06'E, Dec 1991, *Forster PIF9215* (BRI, MEL); Mt Glastonbury, S.F. 242 Glastonbury, 26° 14'S, 152° 27'E, Dec 1991, *Forster PIF9290 & Sharpe* (BRI, K, L, MEL, QRS); S.F. 220 Malmaison, Oakview Forestry, 26° 07'S, 152° 20'E, Mar 2000, *Forster PIF25469 &*

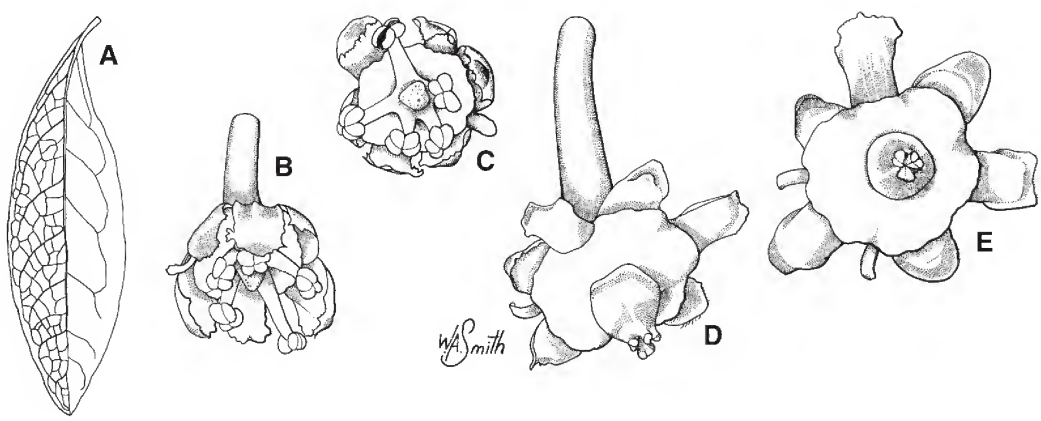


Fig. 6. ***Actephila lindleyi***. A. abaxial leaf surface ×0.5. B. side view of male flower ×6. C. face view of male flower ×6. D. side view of female flower ×6. E. face view of female flower ×6. A from *Forster PIF14262* (BRI); B-E from *Forster PIF24166* (BRI). Del. W. Smith.

Booth (BRI, MEL, QRS). Moreton District: Gold Creek, 2 km WNW of North Arm, 26° 30'S, 152° 55'E, Nov 1990, *Forster PIF7581 & Sharpe* (BRI, CANB, K, L, MEL, QRS); 0.5 km SW of McAfees Lookout, S.F. 309, 27° 25'S, 152° 52'E, Feb 1991, *Forster PIF7788 & Bird* (BRI, QRS); F.R. 809, Mt Glorious, D'Aguilar Range, NW of Brisbane, 27° 20'S, 152° 45'E, Dec 2004, *Forster PIF30403 & Jensen* (BRI, L, MEL, NSW); Mary Cairncross Scenic Reserve, Blackall Range, 3 km SE of Maleny, 26° 49'S, 152° 52'E, Dec 2004, *Forster PIF30426 et al.* (BRI, L, MEL, NSW). **New South Wales.** *c.* 10 miles [16 km] WSW of Dungog on the road to Gresford, Nov 1970, *Blaxell & Coveny 3337* (BRI, CANB, NSW); 1 km E of Toolona Lookout, headwaters of Hopping Dicks Creek, 28° 16'S, 153° 10'E, Nov 1982, *Guymer 1807 & Jessup* (BRI); Wiangaree S.F., *c.* 10 miles NE of Wiangaree, 28° 33'S, 153° 06'E, Oct 1966, *Hayes 2534 et al.* (NSW); Wongawilli, S of Wollongong, 34° 28'S, 150° 45'E, Aug 1986, *Mills s.n.* (NSW540765); Border Ranges N.P., Coff Lyon's road, near Border Loop, 28° 20'S, 153° 38'E, May 1986, *Shapcott s.n.* (BRI [AQ451829]); Yessabah Caves near Kempsey, 31° 06'S, 152° 43'E, Aug 1967, *Telford IRT78* (CANB).

***Distribution and habitat*:** *Actephila lindleyi* has the broadest distribution of the Australian species in this genus (twenty 1° grid cells), ranging from slightly north of Townsville south to Wongawilli near Woollongong (**Map 2**). It is a rarely encountered tree at its southern limit (Mills & Jakeman 1995). This species is invariably found in 'dry' rainforests (araucarian microphyll or semi-deciduous, complex notophyll vineforests and semi-evergreen vinethickets) on a variety of substrates derived from andesites, basalts or metamorphics at altitudes between 40 and 500 m. At some localities (e.g. Lamington National Park, Bunya Mountains National Park), this species may be a dominant part of the rainforest understorey (Laidlaw *et al.* 2000; Butler 2003; Kitching *et al.* 2004).

***Notes*:** Airy Shaw (1971, 1981) openly admitted that *A. lindleyi* as he circumscribed it, was "extraordinarily variable....there is need of much more material before the limits of its variation can begin to be understood". In the present account considerable material that was previously identified as *A. lindleyi* is referred to the species *A. flavescens, A. grandifolia, A. traceyi, A. venusta* and *A. vernicosa.*

Chromosome counts of 2n = 40 were recorded for material of *A. lindleyi* collected at Mt Glorious and the Border Ranges (Shapcott 1998).

A probable, undescribed taxon allied to *A. lindleyi* has been collected at Conway Range near Airlie Beach (Vouchers: Eastern catchment of Repulse Creek, Conway N.P., *c.* 3 km W of Woodcutter Bay, 20° 22'S, 148° 47'E, Oct 1993, *McDonald 5834 & Champion* (BRI); Conway S.F., *c.* 9 km SE of Airlie Beach, 20° 20'S, 148° 45'E, Oct 1993, *McDonald 5848 & Champion* (BRI); Conway S.F., *c.* 2 km E of Impulse Creek

crossing, 20° 21'S, 148° 44'E, Feb 1999, *McDonald 6623 & Kemp* (BRI)) where it occurs in 'seasonally dry' rainforest (semi-deciduous, complex notophyll vineforest) fringing watercourses at an altitude of *c.* 60 m on substrates derived from granite. This material differs from *A. lindleyi* in leaf morphology (principally venation expression); however, only fruiting material has been collected so far.

***Conservation status*:** *Actephila lindleyi* is widespread and locally abundant in many of the extant populations. In Queensland this species is present in Boombana, Fairlies Knob, Goodnight Scrub, Kondalilla, Lamington, Main Range, Mapleton Falls, Mt Bauple, Mt Collosseum, Mt Pinbarren and Nicoll Scrub National Parks, Forest Reserves 287, 309, 471 and 1344, State Forests 9, 28, 53, 86, 95, 220, 242, 435, 866, 893 and 1294. In New South Wales it has been recorded from Border Ranges National Park and Wiangaree State Forest.

***Etymology*:** The species is named for John Lindley (1799-1865), one time Professor of Botany at University College, London, and specialist on Orchidaceae (Stearn 1999).

8. Actephila longipedicellata P.I.Forst. **sp. nov.** ab *A. sessilifoliae* Benth. differt lamina folii basi acuta usque cuneata (adversum cordatam usque subcordatam, saepe aspectu amplexicauli propter petiolum brevem), numero majore venarum lateralium (11–15 non 8–11), floribus masculis pedicellis longioribus (25–34 mm adversum 8–11 mm), sepalis majoribus (3.5–5 × 2.5–4 mm adversum 1.8–2.5 × 1.5–1.8 mm), petalis spathulatis (adversum petala obovata usque oblonga) majoribus (2.8–3.5 × 1.3–2.5 mm non 0.8–1.8 × 0.3–1 mm) et disco 5-angulato (adversum discum annularem) et duplo majore (2.4–5 mm diam. adversum 2–2.8 mm).

Typus: Queensland. Cook District: Garraway Creek rockpiles, 12° 45'S, 143° 11'E, 16 April 1988, *P.I. Forster PIF4227 & D.J. Liddle* (holo: BRI [1 sheet + spirit]; iso: DNA, KEP, SAN, SAR).

Actephila sp. (Claudie River BH 7803) (Hyland *et al.* 1999, 2003).

Subshrub or shrub to 4 m high. Indumentum of simple trichomes, uncoloured, entire plant is glabrous unless stated otherwise. Branchlets glossy, cream to green, lenticellate with age. Stipules triangular to triangular-ovate, 0.7–2 mm long, 0.7–1.2 mm wide, glabrous or irregularly ciliate. Leaves alternate or subverticillate, coriaceous, petiolate; petioles 2–8 mm long, 1–2 mm wide, cream to green, lenticellate; lamina length/petiole length ratio 13.6–42.5 (n=78); lamina obovate to oblanceolate, ± flat, 33–195 mm long, 12–68 mm wide, length/width ratio 1.8–3.7 (n=78); base acute to cuneate; tip acute to acuminate, rarely rounded; midrib above slightly raised (height < 5 times the width), pale green, below prominently raised at lamina base (height ± equal to or > width) then decreasing towards apex, pale green-yellow; venation brochidodromous, comprising 11–15 lateral veins per side of midrib and intercostal reticulate veins; upper surface dark green and glossy, lateral and intercostal venation visible; lower surface pale olive-green and glossy, lateral and intercostal venation prominent, only laterals raised, 1–5° vein orders distinct, 6° vein order indistinct, 7° and onwards vein orders obscure; margin entire, flat to slightly recurved, pale yellow. Inflorescence an axillary fascicle 1–4 mm diameter, rarely interpetiolar, single sex or with both male and female flowers. Male flowers: pedicels filiform, 25–34 mm long, 0.5–0.8 mm diameter; sepals 5, ovate, fused for *c.* 1 mm at base, free lobes 3.5–5 mm long, 2.5–4 mm wide; petals 5, spathulate, 2.8–3.5 mm long, 1.3–2.5 mm wide; disk conspicuous, fleshy, *c.* 1 mm high, 4.5–5.5 mm diameter, annular to weakly 5-angled; stamens 5, filaments 3–3.5 mm long, *c.* 0.5 mm diameter, anthers globose-ovoid, 0.4–0.5 mm long, 0.7–0.8 mm wide. Female flowers: pedicels filiform, 20–47 mm long, 0.5–2 mm diameter; sepals 5, ovate to obovate, fused at base for *c.* 1 mm, free lobes 5–6 mm long, 3.5–4.5 mm wide, glabrous or ciliate along entire edge; petals 5, oblong to spathulate, 3.5–5.5 mm long, 1–2.5 mm wide; disk conspicuous, fleshy, *c.* 1.5 mm high, 5.5–7 mm diameter, annular to weakly 5-angled, annular; ovary 2–4 mm long, 2–5.5 mm diameter; styles 3–(5), simple, shortly connate at base, 2–2.5 mm long, stigmas subcapitate. Fruit: pedicels 30–55 mm long, 0.5–1 mm diameter; capsules globose, rounded, 20–25 mm long, 14–17 mm diameter, strongly bullate, green; columella 7–8 mm long. Seeds 11–15 mm long, 7–9 mm wide, hilum 3–4 mm long, caruncle

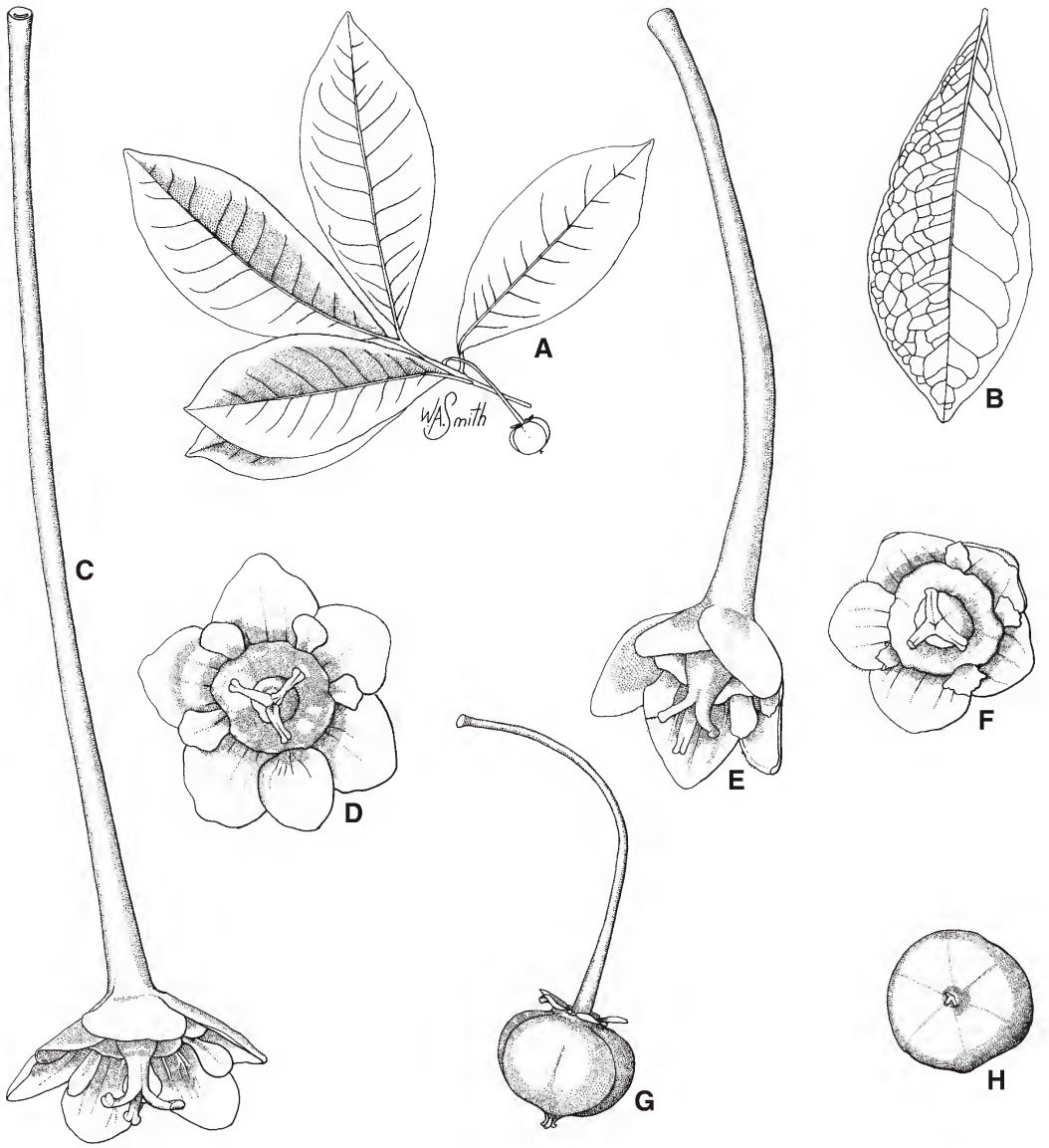


Fig. 7. ***Actephila longipedicellata.*** A. habit of fruiting branch ×0.3. B. abaxial leaf surface ×0.5. C. side view of female flower ×3. D. face view of female flower ×3. E. side view of female flower ×4. F. face view of female flower ×4. G. face view of fruit ×1. H. side view of fruit ×1. A-D, G, H from *Forster PIF15462* (BRI); E, F from *Fell DGF2562* (BRI). Del. W. Smith.

poorly developed, narrow-oblong, 4–6 long, *c.* 0.2 mm wide, cream. **Fig. 7.**

***Additional specimens examined*: Queensland.** Cook District: Tozer Gap, Tozer Range, Jul 1948, *Brass 19449* (BRI); Ridges above Claudie River, 4.5 km NE of Mt Tozer, 12° 44'S, 143° 15'E, May 1992, *Fell DGF2562* (AD, BRI, MEL, QRS); Kennedy Hill Gorge, 12° 28'S, 143° 16'E, Jun 1989, *Forster PIF5411 & Tucker* (BRI); Tozer Range, 12° 44'S, 143° 12'E, Jul 1994, *Forster PIF15462* (BRI, MEL); Claudie River, 12° 45'S, 143° 15'E, Oct 1973, *Hyland 6931* (BRI, QRS); *loc. cit.*, Oct 1974, *Hyland 7803* (BRI, QRS); *loc. cit.*, Nov 1998, *Hyland 16147* (BRI, QRS); cult. Tolga (ex Garraway Creek), 12° 45'S, 143° 11'E, Mar 1996, *Sankowsky 1505* (QRS); *loc. cit.*, Oct 1996, *Sankowsky 1524* (QRS); *loc. cit.*, Apr 1997, *Sankowsky 1557 & Sankowsky* (BRI); *loc. cit.*, Nov 1997, *Sankowsky 1614* (QRS); *loc. cit.*, May 1997, *Sankowsky s.n.* (BRI [AQ654612]); Claudie River, 12° 45'S, 143° 15'E, Nov 1977, *Stocker 1625* (CANB, QRS); Iron Range, Jul 1963, *Volck AFO2647* (QRS).

***Distribution and habitat*:** *Actephila longipedicellata* has been collected in three localities (Garraway Creek and Tozer Gap near Iron Range, and Kennedy Hill) within a single 1° grid cell on far north Cape York Peninsula, Queensland (**Map 5**). Plants grow in the understorey of 'seasonally dry' rainforest (evergreen complex notophyll vineforest) in rocky situations (along creeks or on ridges), with granite boulders in much evidence at altitudes between 20 and 240 m.

***Notes*:** *Actephila longipedicellata* was first collected by Brass in 1948 and collections made prior to 1999 were usually identified as *A. lindleyi*. *Actephila longipedicellata* is similar on morphological grounds (short petioles, long pedicels) to *A. sessilifolia*, but differs from that species in the leaf lamina with an acute to cuneate base (versus cordate to subcordate, often appearing stem clasping due to short petiole); the greater number of lateral veins (11–15 versus 8–11); the male flowers with longer pedicels (25–34 mm versus 8–11 mm), larger sepals (3.5–5 × 2.5–4 mm versus 1.8–2.5 × 1.5–1.8 mm), spathulate petals (versus obovate to oblong) that are larger (2.8–3.5 × 1.3–2.5 mm versus 0.8–1.8 × 0.3–1 mm) and a disk (versus annular) that is twice as large (4.5–5 mm diameter versus 2–2.8 mm).

***Conservation status*:** *Actephila longipedicellata* has a restricted distribution with perhaps as many as three populations. The area of occupancy and the number of individuals within populations are unknown. One population is within Iron Range National Park. Further survey work is required to determine whether this species is deserved of conservation listing. The population at Garraway Creek is under localised threat from destruction of vegetation by tourists and local inhabitats that use the area for short-term recreational camping.

***Etymology*:** The specific epithet is derived from the Latin words *longus* (long) and *pedicellus* (pedicel) and refers to the consistently long flower pedicels in this species.

9. Actephila petiolaris Benth., *Fl. Austral.* 6: 90 (1873). **Type:** Queensland. "Rockingham Bay", *Dallachy s.n.* (holo: K [photo at BRI!]).

Subshrub, shrub or small tree to 8 m high. Indumentum of simple trichomes, fawn or ferruginous, entire plant is glabrous unless stated otherwise. Branchlets glossy, fawn-tan to olive-green, glabrous or with sparse indumentum when young, lenticellate with age. Stipules triangular, 1.2–2 mm long, 0.8–1.5 mm wide. Leaves alternate, coriaceous, petiolate; petioles 9–80 mm long, 1–1.5 mm wide, olive green, glabrous or with sparse indumentum, glabrescent and occasionally lenticellate with age; lamina length/petiole length ratio 2–8.7 (n=106); lamina elliptic-ovate, ovate or obovate, ± flat, 48–190 mm long, 25–90 mm wide, length/width ratio 1.5–3.3 (n=106); base cuneate, obtuse or rounded; tip acute, abruptly acute, acuminate or caudate; midrib above ± flat, dark green, below prominently raised at lamina base (height > width) then decreasing towards apex, pale olive-green; venation brochidodromous, comprising 9–12 lateral veins per side of midrib and intercostal reticulate veins; upper surface dark green and glossy, lateral venation barely visible, intercostal venation obscure; lower surface olive green and glossy, lateral venation prominent and slightly raised, intercostal venation visible but not raised, 1–4° vein orders distinct, 5° vein order indistinct, 6° and onwards vein orders obscure; margin entire, flat, olive-

green. Inflorescence an axillary fascicle 2–4 mm diameter, single sex or with both male and female flowers. Male flowers: pedicels stout, 3–7 mm long, 0.6–0.8 mm diameter; sepals 5, oblong to oblong-ovate, 3–4 mm long, 1.3–2.8 mm wide, apices glabrous or sparsely ciliate; petals absent, or rarely one or two present, oblanceolate, 1.8–2.5 mm long, 0.5–1.2 mm wide, irregularly lacerate at tip; disk conspicuous, fleshy, 0.8–1.2 mm high, 3.5–6 mm diameter, 5-angled; stamens 4 or 5, filaments 2–2.5 mm long, *c.* 0.2 mm diameter, anthers globose-ovoid, 0.2–0.3 mm long, 0.4–0.5 mm wide. Female flowers: pedicels filiform, 9–35 mm long, 0.5–0.8 mm diameter; sepals 5, oblong to oblong-ovate, 1.8–3.2 mm long, 1.8–2 mm wide, apices densely ciliate, occasionally with sparse indumentum down centre of sepal externally; petals absent or rarely one or two present, oblanceolate, 1.2–2 mm long, 0.3–0.5 mm wide; disk conspicuous, fleshy, 1–2 mm high, 3–4.5 mm diameter, 5-angled; ovary 2–4 mm long, 2–5 mm diameter; styles 3, simple, shortly connate at base, 1–1.8 mm long, stigmas subcapitate. Fruit: pedicels 23–30 mm long, *c.* 1.5 mm diameter; capsules depressed-globose, rounded, 10–20 mm long, 15–27 mm diameter, strongly bullate, green; columella 7–9 mm long. Seeds 6–12 mm long, 5–9 mm wide, olive green; hilum 1–2.5 mm long, caruncle poorly developed, narrow-oblong, 1–4 mm long, *c.* 0.2 mm wide, cream. **Fig. 8.**

***Notes*:** There is significant variation in the morphology of the collections referred here to *A. petiolaris*, notably the length of the petiole relevant to the length of the leaf lamina, leaf shape and indumentum colour and density on young foliage. This variation is geographically and ecologically based and is formalised by the recognition of subspecies.

***Etymology*:** The specific epithet is formed from the Latin word *petiolus* (petiole) and alludes to the long petiole of this species.

Key to subspecies of *Actephila petiolaris*

1 Foliage glabrous or with scattered fawn indumentum when young; leaf lamina length/petiole length ratio 2-7.4 . . . . . **A. petiolaris** subsp. **petiolaris**

1: Foliage with sparse ferruginous-brown indumentum when young; leaf lamina length/petiole ratio 5-8.7 . . . . . **A. petiolaris** subsp. **jagonis**

9a. *Actephila petiolaris* subsp. *petiolaris*

Shrub or small tree to 8 m high. Indumentum absent, or fawn. Leaf glabrous or with scattered indumentum when young; leaf lamina length/petiole length ratio 2–7.4 (n=79); lamina elliptic-ovate, rarely obovate.

***Additional specimens examined*: Queensland.** Cook District: Cedar Bay, 15° 47'S, 145° 21'E, Jan 1973, *Dick sub Webb & Tracey 13774* (BRI); Churchill Creek, Churchill L.A., S.F. 143, 16° 34'S, 145° 19'E, Jul 1995, *Forster PIF17208 & Figg* (BRI, QRS); cult. Tolga (ex Churchill Creek near Julatten), 16° 34'S, 145° 19'E, Jan 2002, *Forster PIF28205, PIF28206* (BRI); S.F.R. 675, Mulgrave L.A., 17° 05'S, 145° 42'E, Mar 1980, *Gray 1665, 1668* (BRI, QRS); S.F.R. 675, Little Mulgrave Valley, 17° 06'S, 145° 41'E, Jun 1996, *Gray 6778* (QRS); S.F.R. 675, 17° 05'S, 145° 40'E, Nov 1976, *Hyland 3481RFK* (QRS), *3482RFK* (QRS), *3483RFK* (CANB, QRS); S.F.R. 675 Grafton, Mulgrave L.A., 17° 05'S, 145° 42'E, Nov 1988, *Hyland 25619RFK* (QRS); S.F.R. 675, East Mulgrave L.A., 17° 05'S, 145° 40'E, Dec 1976, *Hyland 9249* (QRS); S.F.R. 675 Grafton, Mulgrave L.A., 17° 05'S, 145° 42'E, Nov 1988, *Hyland 13719* (CANB, QRS); Cooper Creek, east of Turpentine road, 16° 09'S, 145° 24'E, Jun 2001, *Jago 6004* (BRI); Coopers Creek, via Daintree, Jun 1969, *Mazlin AFO4347* (QRS); cult. Tolga (ex Churchill Creek), Nov 1999, *Sankowsky 1680, 1681 & Sankowsky* (QRS); *loc. cit.*, Dec 2005, *Sankowsky 2554 & Sankowsky* (BRI); cult. Tolga (ex S.F.R. 675 Grafton, Mulgrave L.A., 17° 05'S, 145° 42'E), Dec 2004, *Sankowsky 2555 & Sankowsky* (BRI); Coopers Creek, Cape Tribulation, 16° 10'S, 145° 25'E, Oct 1997, *Small 14* (QRS); Gap Creek, *c.* 8 miles [13.3 km] back from Ayton, May 1969, *Smith 14444* (BRI); Bloomfield, May 1969, *Volck AFO4311* (QRS).

***Distribution and habitat*:** *Actephila petiolaris* subsp. *petiolaris* is endemic to the 'Wet Tropics'

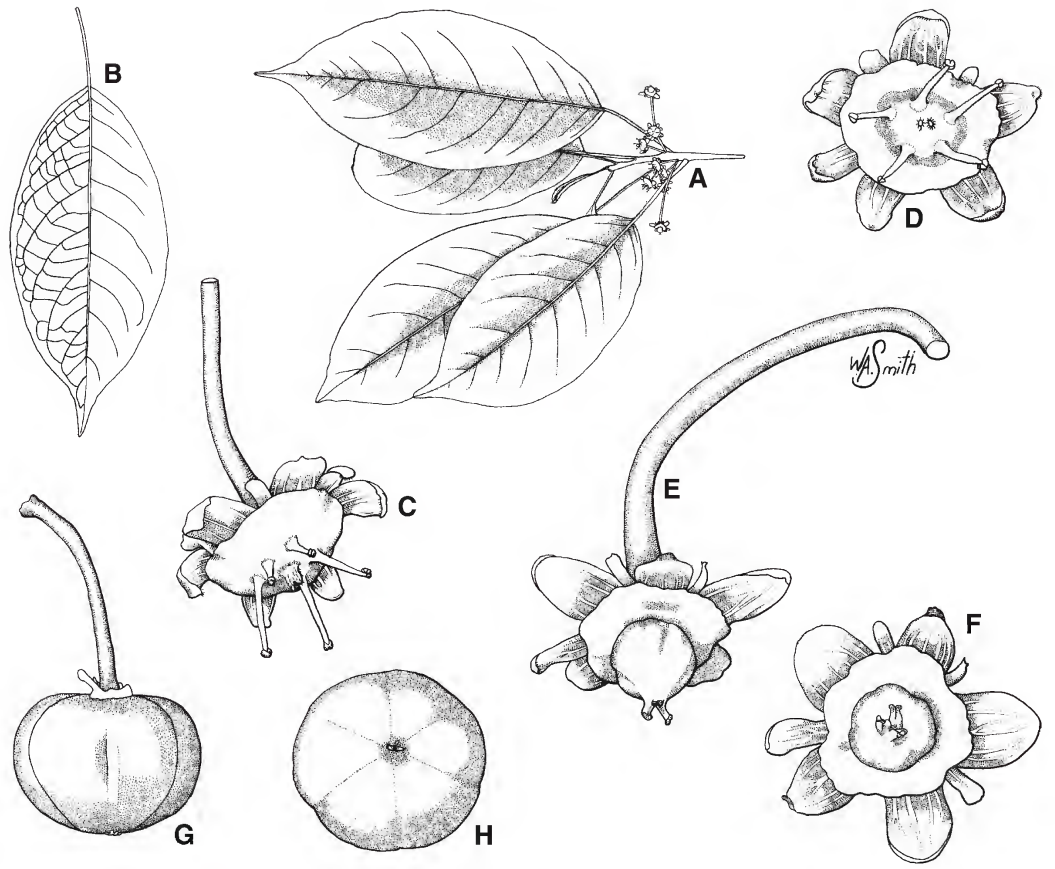


Fig. 8. ***Actephila petiolaris*** subsp. ***petiolaris.*** A. habit of flowering branch ×0.5. B. abaxial leaf surface ×0.5. C. side view of male flower ×6. D. face view of male flower ×6. E. side view of female flower ×6. F. face view of female flower ×6. G. side view of fruit ×2. H. face view of fruit ×2. A-D from *Forster PIF28205* (BRI); E, F from *Forster PIF28206* (BRI); G, H from *Forster PIF17208* (BRI). Del. W. Smith.

bioregion of north-eastern Queensland with a northern limit at Gap Creek and a southern limit in the Little Mulgrave Valley (**Map 3**). Despite the different labelling of collections, there are only four localities known, *viz.* Cedar Bay - Bloomfield – Gap Creek, Churchill Creek, Cooper Creek and S.F.R. 675. Plants occur at altitudes between 20–300 m in the understorey of 'wet' rainforest (evergreen, complex mesophyll or notophyll vineforest) on alluvium derived from metamorphics along watercourses at altitudes between 100 and 440 m.

***Notes*:** A number of collections are provisionally placed here, notably those from Cooper Creek north of the Daintree River. These particular collections (*Mazlin AFO4347*, *Jago 6004* and *Small 14*) have particularly large leaves with caudate leaf apices and show some similarities to *A. foetida*. They lack the indumentum and pattern of interlateral venation that is present in *A. foetida*, but share its habit (small shrub) and leaf size variation. Leaf size appears to be highly variable in *A. petiolaris* subsp. *petiolaris*, but this is not particularly unusual in understorey trees and shrubs that are subjected to variable regimes of light.

***Conservation status*:** *Actephila petiolaris* subsp. *petiolaris* is present in several National Parks (Cedar Bay, Daintree) and two State Forests (143, 675). There is no information available as to the area of occupancy or the number of individuals within populations. It is not considered to be under threat.

9b. Actephila petiolaris subsp. **jagonis** P.I.Forst., **subsp. nov.** a forma typica *Actephilae petiolaris* Benth. frondescentia juvenile vestita indumento sparso ferrugineo (adversum glabram vel indumentum dissitum hinnuleum juvenile), lamina obovata rarius elliptico-ovata (adversum ovatam rarius obovatam) et folii ratione longitudinis laminae ad longitudine petiolo majore (5–8.7 non 2–7.4) distinguitur.

Typus: Queensland. Cook District: on track from Power Station, to Mt Surprise Creek [Barron Gorge], 16° 51'S, 145° 38'E, 23 January 1993, *R.L. Jago 2030* (holo: BRI [1 sheet]).

Subshrub to 2 m tall. Indumentum ferruginous-brown. Leaf with sparse indumentum when young; leaf lamina length/ petiole length ratio 5–8.7(n=27); lamina obovate, rarely elliptic-ovate.

***Additional specimens examined*: Queensland.** Cook District: Barron Gorge, 16° 50'S, 145° 38'E, Feb 1994, *Cooper WWC797 & Cooper* (QRS); Barron Gorge National Park, 16° 51'S, 145° 38'E, Feb 1996, *Forster PIF18644 & Jago* (BRI, QRS); N.P.R. 880, Parish of Cairns [Barron Gorge], 16° 51'S, 145° 38'E, Apr 1994, *Hyland 15085* (QRS).

***Distribution and habitat*:** *Actephila petiolaris* subsp. *jagonis* is known only from the Barron Gorge National Park near Cairns in the 'Wet Tropics' of north-eastern Queensland (**Map 3**). This locality is within the overall geographical range of *A. petiolaris* but is disjunct from the populations of *A. petiolaris* subsp. *petiolaris* and occurs in a different and much 'drier' rainforest type. Plants occur on steep slopes in semi-deciduous microphyll vineforest on substrates derived from metamorphics at altitudes between 100 and 330 m.

***Notes*:** This taxon is included as a subspecies of *A. petiolaris* with some reservations. Flowers of this plant have not been seen and it may well prove to be specifically distinct from *A. petiolaris* subsp. *petiolaris* that is a larger, generally glabrous plant, with generally longer leaf petioles and leaf laminas that are nearly always elliptic-ovate (versus nearly always obovate). The type collection of *A. petiolaris* subsp. *jagonis* has a single, badly mangled fruit. This fruit appears smaller than those found on *A. petiolaris* subsp. *petiolaris*, but until better material is obtained, the uniqueness of the size disparity cannot be determined.

***Conservation status*:** The only known population of this taxon is within Barron Gorge National Park. Survey of the population is required to determine the area of occupancy, the number of plants that are present and any threats that they may face. Due to its occurrence in a single population this subspecies is probably deserved of conservation listing.

***Etymology*:** *Actephila petiolaris* subsp. *jagonis* is named to honour R.L. (Bob) Jago of Cairns, plant collector and amateur botanist extraordinaire. Bob has contributed over 2000 herbarium collections to the Queensland Herbarium and was the first to collect this plant.

10. Actephila plicata P.I.Forst., **sp. nov.** ab *A. latifolia* Benth. folii lamina plicata non plana margine revoluto non plano, floribus foemineis sepalis longioribus (2.8–3.5 mm adversum 2–2.5 mm), petalis oblongis usque oblanceolatis (in illa obovatis) et majoribus (2.5–3 x *c.* 0.8 mm adversum 1–2 × 0.5–1 mm) et frutice 5-lobato (in illa rotundato) differt.

Typus: Queensland. North Kennedy District: Mt Dryander, left branch Dryander Creek, 15 km N of Proserpine, 20° 16'S, 148° 34'E, 6 February 2004, *P.I. Forster PIF29943, R. Jensen & M.C. Tucker* (holo: BRI [1 sheet + spirit]; iso: MEL, NSW).

Shrub or small tree to 6 m high. Indumentum of simple trichomes, uncoloured, entire plant is glabrous unless stated otherwise. Branchlets glossy, brown, lenticellate with age. Stipules ovate to triangular-ovate, 1–1.8 mm long, 1–1.8 mm wide, irregularly crenate. Leaves alternate or subverticillate, coriaceous, petiolate; petioles 3–25 mm long, 1.5–2.5 mm wide, olive-green, lenticellate; lamina length/petiole length ratio 6–20 (n=110); lamina elliptic to obovate, plicate, 37–207 mm long, 20–75 mm wide, length/width ratio 1.6–3.3 (n=110); base acute to cuneate; tip acute to rounded; midrib above ± flat, dark green, below prominently raised at lamina base (height > width) then decreasing towards apex, pale olive-green; venation brochidodromous, comprising 10–14 lateral veins per side of midrib

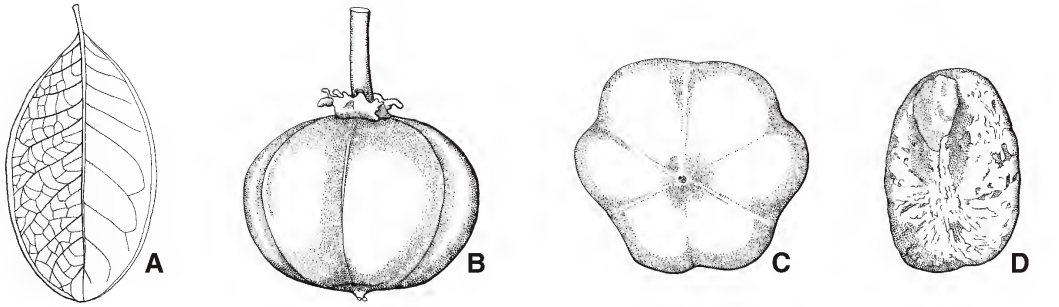


Fig. 9. ***Actephila plicata.*** A. abaxial leaf surface ×0.5. B. side view of fruit ×1.5. C. face view of fruit ×1.5. D. ventral view of seed ×3. A, D from *Cooper WWC1576* (BRI); B, C from *Forster PIF29943* (BRI). Del. W. Smith.

and intercostal reticulate veins; upper surface dark green and glossy, lateral and intercostal venation visible; lower surface pale olive-green and matt, lateral and intercostal venation prominent with laterals raised, 1–3° vein orders distinct, 4° vein order indistinct, 5° and onwards vein orders obscure; margin entire, revolute, pale olive-green. Inflorescence an axillary fascicle 2–8 mm diameter, rarely interpetiolar, single sex or with both male and female flowers. Male flowers not seen. Female flowers: pedicels stout, 8–10 mm long, 1–1.5 mm diameter; sepals 5, obovate, 2.8–3.5 mm long, 1.2–2.2 mm wide, ciliate in patch at the apices; petals absent or one or two present, oblong or oblanceolate, 2.5–3 mm long, *c.* 0.8 mm wide; disk conspicuous, fleshy, 1–1.5 mm high, 4–5.5 mm diameter, 5-angled; ovary, styles and stigmas not seen. Fruit: pedicels 6–10 mm long, 1–1.5 mm diameter; capsules depressed-globose, strongly pentalobate, 12–14 mm long, 15–19 mm diameter, strongly bullate, green; columella 8–12 mm long. Seeds 7–11 mm long, 5–8.5 mm wide, pale tan and fawn to olive-green and tan; hilum 2–5 mm long, caruncle narrow oblong, 2–3 mm long, 0.5–1 mm wide, cream. **Fig. 9.**

***Additional specimens examined*: Queensland.** North Kennedy District: S.F. 387, 2 km SSW of dam wall on Proserpine River, 20° 23'S, 148° 22'E, May 1991, *Forster PIF8318 & McDonald* (BRI, K, L, MEL, QRS); Mt Dryander S.F., Dryander Creek left branch, 20° 16'S, 148° 34'E, Oct 1999, *Forster PIF24997 & Booth* (BRI, MEL, QRS); headwaters of Dryander Creek, Mt Dryander, 20° 15'S, 148° 35'E, Oct 1969, *Webb & Tracey 10040* (BRI). South Kennedy District: Scawfell Island, 20° 53'S, 149° 37'E, Nov 1986, *Batianoff 6175 & Hegerl* (AD, BRI); Scawfell Island National Park, 20° 53'S, 149° 37'E, Nov 1986, *Batianoff 6303* (BRI); Dugong Inlet, Whitsunday Island, 20° 15'S, 148° 57'E, Sep 1990, *Batianoff 900971 & Batianoff* (BRI); Cape Hillsborough National Park, 20° 15'S, 149° 02'E, Aug 1992, *Batianoff 920889* (BRI); Puritan Bay, Conway National Park, 20° 28'S, 148° 53'E, May 1994, *Batianoff 94053 & Dillewaard* (BRI); Keswick Island, Connie Bay, 20° 54'S, 149° 24'E, Sep 1996, *Batianoff 9609111 & Champion* (BRI); Cape Hillsborough N.P., along track to Hidden Valley, 20° 55'S, 149° 02'E, Sep 2001, *Cooper WWC1576 & Cooper* (BRI); R299 Conway, Repulse Bay, Jun 1981, *Dansie AFO5230* (QRS).

***Notes*:** Male flowers have not been examined for this species. There are morphological obvious similarities between *A. plicata* and *A. latifolia* that occurs further north; however, the former differs from *A. latifolia* in the leaf lamina being plicate (versus flat) with a revolute margin (versus flat); the female flowers with longer sepals (2.8–3.5 mm versus 2–2.5 mm), petals that are oblong to oblanceolate (versus obovate) and larger (2–5-3 × *c.* 0.8 mm versus 1–2 × 0.5–1 mm) and the strongly pentalobate fruit (versus rounded).

***Distribution and habitat*:** *Actephila plicata* is endemic to central Queensland with a northern limit at Mt Dryander and a southern limit at Cape Hillsborough National Park where it occurs in coastal areas of the mainland and on offshore continental islands (**Map 5**). Plants occur in 'dry' rainforest and vinethicket (littoral microphyll vineforest, semi-deciduous, complex notophyll vineforest) on granite substrates from near sea level to 100 m altitude.

***Conservation status*:** *Actephila plicata* is present in several National Parks (Cape Hillsborough, Conway, Dryander, Scawfell Island) and two State Forests (387, 432). There is no information available as to the area of occupancy or the number of individuals within populations. It is not considered under threat.

***Etymology*:** The specific epithet is formed from the Latin word *plicatus* (folded) and alludes to the appearance of the leaf lamina.

11. Actephila sessilifolia Benth., *Fl. Austral.* 6: 90 (1873). **Type:** Queensland. Port Curtis District: ["Shrub of 4-6 ft at the Caves Mountain, 5 miles west of Morinish"], *Thozet s.n.* (lecto: MEL; isolecto: K [with no locality data, photo at BRI], *fide* Airy Shaw (1980b: 217).

***Illustrations*:** Calvert *et al.* (2005: 12).

Subshrub or shrub to 6 m high. Indumentum of simple trichomes, uncoloured or ferruginous, entire plant is glabrous unless stated otherwise. Branchlets glossy, fawn to ferruginous brown, lenticellate with age. Stipules triangular, 1–1.2 mm long, 0.8–1 mm wide, occasionally ciliate. Leaves alternate or subverticillate, coriaceous, petiolate, appearing sessile due to shape of lamina base; petioles 1–7 mm long, 1–2 mm wide, grey-fawn, lenticellate; lamina length/petiole length ratio 12.5–125 (n=222); lamina elliptic, obovate or oblanceolate, rarely orbicular, ± flat, 19–152 mm long, 9–60 mm wide, length/width ratio 1.5–3.6 (n=222); base cordate to subcordate, often falsely stem clasping due to short petiole; tip acute to rounded, rarely caudate or retuse; midrib above ± flat or slightly raised (height < 5 times the width) pale green, below slightly raised at lamina base (height ± equal to width) then decreasing towards apex, pale olive-green; venation brochidodromous, comprising 8–11 lateral veins per side of midrib and intercostal reticulate veins; upper surface dark green and glossy, lateral venation visible, intercostal venation weakly visible to ± obscure; lower surface pale olive-green and glossy, lateral and intercostal venation visible, but weakly raised, 1° and 2° vein orders distinct, 3° vein order indistinct, 4° and onwards vein orders obscure; margin entire, weakly revolute, yellow-green. Inflorescence an axillary fascicle 1–2 mm diameter, single sex or with both male and female flowers. Male flowers: pedicels filiform, 6–8 mm long, 0.3–0.5 mm diameter; sepals 5, obovate to ovate, 1.8–2 mm long, 1.5–1.8 mm wide, ciliate on upper margin; petals absent or 1–5, oblong to obovate, 0.8–1.8 mm long, 0.3–1 mm wide; disk conspicuous, fleshy, 0.4–0.5 mm high, 2–2.8 mm diameter, annular; stamens 5, filaments 1–1.2 mm long, *c.* 0.2 mm diameter, anthers globose-ovoid, 0.3–04 mm long, 0.4–0.5 mm wide. Female flowers: pedicels filiform, 20–32 mm long, 0.1–0.2 mm diameter; sepals 5, obtuse to ovate, 2.1–4 mm long, 1.2–2.8 mm wide, glabrous or ciliate towards the apices; petals 1–5, oblanceolate, oblong or obovate, 1.2–1.4 mm long, 0.3–1 mm wide; disk conspicuous, fleshy, 0.8–1 mm high, 2.8–4 mm diameter, 5-angled; ovary 2–2.5 mm long and 2–4 mm diameter; styles 3, simple, shortly connate at base, 1.5–1.8 mm long, stigmas subcapitate. Fruit: pedicels 22–36 mm long, *c.* 0.5 mm diameter; capsules depressed-globose to subglobose, rounded, 9–11 mm long, 13–16 mm diameter, weakly to strongly bullate, green to green-black; columella 4–7 mm long. Seeds 6–9 mm long, 4.5–8 mm wide, olive green or olive

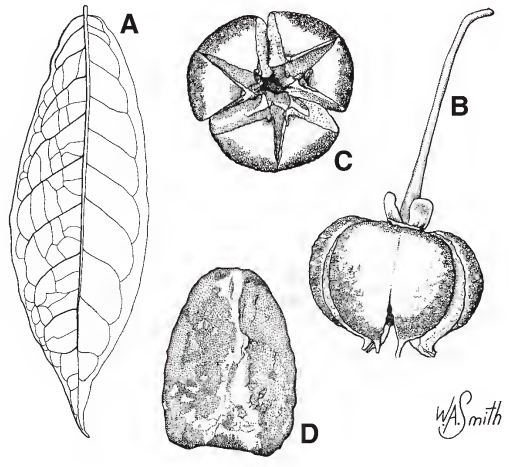


Fig. 10. ***Actephila sessilifolia.*** A. abaxial leaf surface ×0.25. B. side view of fruit ×1.5. C. face view of dehiscing fruit ×1.5. D. ventral view of seed ×3. All from *Forster PIF8113* (BRI). Del. W. Smith

green and dark green in irregular patterns; hilum 2–3.5 mm long, caruncle narrow-oblong, 1.5–5 mm long, 0.5–1 mm wide, cream. **Fig. 10.**

***Selected specimens examined*: Queensland.** North Kennedy District: Emmett Creek, Bowling Green Bay National Park, S of Townsville, Aug 1991, *Bean 3605* (BRI); Mt Burrumbush, Bowling Green Bay National Park, S of Townsville, 19° 28'S, 147° 05'E, Aug 1991, *Bean 3658* (BRI); Lower slopes of Mt Quandong, c. 21 km SW of Proserpine, 20° 29'S, 148° 24'E, May 2002, *Champion 1843 et al.* (BRI); Emmett Creek, Saddle Mountain, 19° 26'S, 147° 02'E, Jul 1995, *Cumming 13611* (BRI); Mt Cataract, W of Townsville, 19° 17'S, 146° 30'E, Oct 1996, *Cumming 15223* (BRI); Mt Quandong, Proserpine Valley, May 1982, *Dansie AFO5173* (QRS); Seaview Range, Apr 1947, *Flecker N.Q.N.C.10880* (QRS); N.P.R. 629, Paluma Range, Rollingstone Creek (West Branch) off Pace road, 19° 04'S, 146° 21'E, Dec 2003, *Ford et al. 4222* (QRS); Dryander Creek left branch, SE slope of Mt Dryander, 20° 16'S, 148° 34'E, Jun 1989, *Forster PIF5127 et al.* (BRI); Elliott Toe, Bowling Green Bay National Park, 9 km NNE of Woodstock, 19° 31'S, 146° 52'E, May 1991, *Forster PIF8361 & Bean* (BRI, QRS); lower western slopes of Mt Dryander, 20° 15'S, 148° 33'E, Jul 1974, *Moriarty 1866* (QRS); Gregory Creek, 20° 16'S, 148° 36'E, *Perry s.n.* (BRI [AQ566535]). South Kennedy District: N of Pine Mt, 8 km NNW of Marlborough, 22° 45'S, 149° 51'E, Jul 1997, *Fensham 3282* (BRI); T.R. 179 Kalvin, 6 km W of Koumala, 21° 36'S, 149° 11'E, Apr 1991, *Forster PIF8032 & McDonald* (BRI, MEL, QRS); T.R. 179 Kalvin, 6 km WSW of Koumala, 21° 37'S, 149° 10'E, Apr 1991, *Forster PIF8045 & McDonald* (BRI); Coffee Creek, NE base of Mt Jukes, 20° 59'S, 148° 57'E, Apr 1991, *Forster PIF8113 & McDonald* (BRI); Mt Adder, southern base of Mt Jukes, 20° 59'S, 148° 55'E, Apr 1991, *Forster PIF8118 & McDonald* (BRI, MEL, QRS); S.F. 658 Carawatha, 20° 47'S, 148° 34'E, Apr 1991, *Forster PIF8198 & Tucker* (BRI, K, MEL, QRS); S.F. 658 Carawatha, 20° 47'S, 148° 34'E, Jun 1995, *Forster PIF16724 & Tucker* (BRI, QRS); Headwaters of Coffee Creek, eastern side of Mt Jukes (N.P. 616 Ossa), 21° 02'S, 148° 55'E, Nov 1989, *McDonald 4401 et al.* (BRI); St Helen's Gap, between Mirani & Calen, 21° 00'S, 148° 42'E, Nov 1989, *McDonald 4510 et al.* (BRI, QRS); headwaters of Cameron Creek, E foothills of Clarke Range, *c.* 6 km NW of Koumala, 21° 34'S, 149° 11'E, Jun 1994, *McDonald 5983 & Champion* (BRI). Leichhardt District: S.F. 82 Connors, headwaters of East Funnel Creek, 21° 34'S, 149° 11'E, Jun 1994, *McDonald 5976 & Champion* (BRI). Port Curtis District: S.F. 878, W of Rockhampton, 23° 18'S, 150° 09'E, Jul 1993, *Fensham 1080* (BRI); Mt Larcom, 5 km NW of Yarwun, 23° 48'S, 151° 05'E, Jan 1994, *Forster PIF14646* (BRI); Curtis Island, 23° 32'S, 151° 06'E, Sep 1994, *Thomas s.n.* (BRI [AQ582433], NSW); 25 km NNW of Gladstone, 23° 42'S, 151° 03'E, Feb 1997, *Thompson GLA13 & Turpin* (BRI); Rundle Range State Forest, *c.* 10 miles [16.7 km] SE of Port Alma near O'Connor Creek, near mouth of Fitzroy River, 23° 40'S, 150° 59'E, May 1971, *Webb & Tracey 10462A* (BRI, MEL). Burnett District: McLaughlin's road, Yarrol Scrub, 21 km E of Monto, 24° 53'S, 151° 19'E, Dec 2004, *Forster PIF30482 & Beard* (A, BRI, L, MEL, MO, NE, NSW). Wide Bay District: Kirbys Road, Bundaberg, 24° 49'S, 152° 23'E, Sep 1999, *Forster PIF24923 & Schmitt* (BRI).

***Distribution and habitat*:** This species is much more widespread than thought by Airy Shaw (1980b) who examined material from only three localities. *Actephila sessilifolia* has a known range from the Paluma Range, west of Townsville, south to Yarrol near Monto (**Map 3**). Plants are usually locally common in the understorey of 'dry' rainforest (semi-deciduous, complex to simple, mesophyll to notophyll vineforest) or more rarely vinethickets (semi-evergreen vinethicket), on alluvium or rocky situations, on substrates derived from basalt, granite or metasediments at altitudes between 30 and 490 m.

***Notes*:** Due to the cordate nature of the leaf base in *Actephila sessilifolia*, the shortly petiolate leaves give the impression that the leaves are sessile. This character combination is unique within *Actephila*. Although this character state is approached in some specimens of *A. longipedicellata*, this latter species does not have a cordate base to the leaf lamina.

***Conservation status*:** *Actephila sessilifolia* is present in Bowling Green Bay, Mt O'Connell, Pioneer Peaks and Rundle Range National Parks and State Forests 55, 82, 179, 207, 658 and 878. Many of the populations are small and fragmented due to land clearing, fire incursions and competition from weeds. The populations in the southern part of the known distribution range are small and not in conservation reserves. There is no information available as to the area of occupancy or the numbers of individuals within populations. This species is not considered threatened although it is currently listed as *Rare* under the *NCA*.

***Etymology*:** The specific epithet is formed from the Latin words *sessili* (sessile, stalkless) and –*folius* (leaves) and alludes to the superficial appearance of the foliage.

12. Actephila traceyi P.I.Forst., **sp. nov.** ab *A. lindleyi* (Steud.) Airy Shaw folii lamina numero majore venarum lateralium (11–16 non 7–12), floribus masculis pedicellis longissimis (5–16 non 1.5–5 mm), sepalis ovato-spathulatis (adversum sepala oblonga usque ovata) et longioribus (3.5–5 non 1–3 mm), disco 5-angulato (in illa rotundato), frutice majore (11–15 × 16–24 mm adversum 9–12 × 11–13.5 mm) et seminibus majoribus (10–14 × 7–12 adversum 6–7 × 5–6.5) pallide olivaceis usque olivaceis (non atro-olivaceis) differt.

Typus: Queensland. Cook District: Leo Creek area, Timber Reserve 14, McIlwraith Range, 13° 45'S, 143° 23'E, 21 June 1995, *P.I.Forster PIF16894* (holo: BRI [1 sheet + spirit]; iso: MEL).

Actephila sp. (Rocky River G.C.Stocker 1042) (Forster & Henderson 1997: 70; Forster & Halford 2002: 68).

Subshrub or shrub to 3 m high. Indumentum of simple trichomes, uncoloured, entire plant is glabrous unless stated otherwise. Branchlets glossy, fawn-tan, lenticellate with age. Stipules narrow-triangular to triangular, 0.5–1.8 mm long, 0.8–1 mm wide. Leaves alternate, subopposite or subverticillate, coriaceous, petiolate; petioles 3–23 mm long, 1–1.5 mm wide, deeply grooved on top with distinct rim to 0.5 mm high, yellow-green, lenticellate with age; lamina length/petiole length ratio 6.2–18.6 (n=128); lamina obovate to oblanceolate, rarely elliptic-ovate, ± flat, 55–170 mm long, 23–66 mm wide, length/width ratio 1.7–3.2 (n=128); base acute to cuneate; tip acute to acuminate, rarely rounded; midrib above slightly raised (height < 5 times the width), yellow-green, below strongly raised at lamina base (height ± equal to width) then decreasing towards apex, yellow; venation brochidodromous, comprising 11–16 lateral veins per side of midrib and intercostal reticulate veins; upper surface dark green and glossy, lateral and intercostal venation visible; lower surface pale yellow-green and glossy, lateral and intercostal venation prominent, slightly raised, 1–3° vein orders distinct, 4° vein order indistinct, 5° and onwards vein orders obscure; margin entire, flat, yellow-green. Inflorescence an axillary fascicle 2–4 mm diameter, single sex or with both male and female flowers. Male flowers: pedicels filiform, 5–16 mm long, 0.6–1.2 mm diameter; sepals 5, ovate-spathulate, 3.5–5 mm long, 2–4 mm wide, ciliate in dense apical patch and with occasional marginal cilia; petals absent or 1, narrow-oblong to oblong-spathulate, 1–2 mm long, 0.2–0.8 mm wide; disk conspicuous, fleshy, 1–1.8 mm high, 4–6 mm diameter, 5-angled; stamens 5, filaments 2.5–3.8 mm long, 0.2–0.3 mm diameter, anthers globose-ovoid, 0.4–0.8 mm long, 0.2–0.5 mm wide. Female flowers: pedicels filiform, 10–22 mm long, 0.7–1 mm diameter; sepals 5, spathulate, 3.5–4 mm long, 2.2–3 mm wide, glabrous; petals absent; disk conspicuous, fleshy, 1.5–2 mm high, 5–6 mm diameter, annular; ovary not seen; styles 3, simple, shortly connate at base, *c.* 2 mm long, stigmas subcapitate. Fruit: pedicels 15–35 mm long, 0.7–1 mm diameter; capsules depressed-

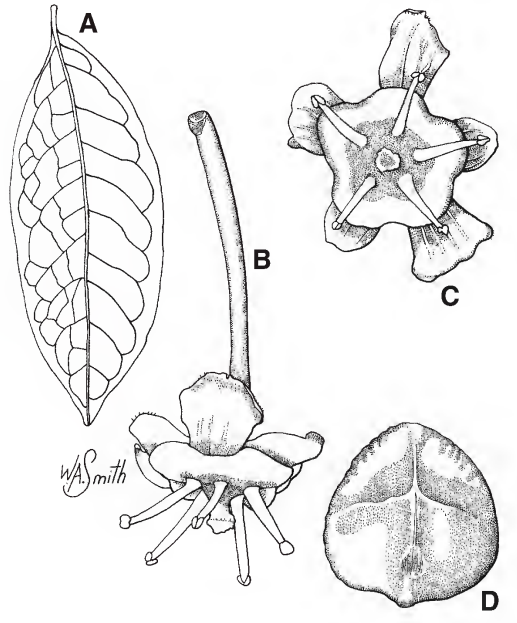


Fig. 11. ***Actephila traceyi.*** A. abaxial leaf surface ×0.5. B. side view of male flower ×6. C. face view of male flower ×3. D. ventral view of seed ×2. A from *Forster PIF10607* (BRI), B, C from *Tucker 3006* (BRI), D from *Stocker 1042* (BRI). Del. W. Smith.

globose, rounded, 11–15 mm long, 16–24 mm diameter, strongly bullate, green; columella 7–11 mm long. Seeds 10–14 mm long, 7–12 mm wide, pale olive tan to olive green; hilum 3–5 mm long, caruncle narrow-oblong, 2–4 mm long, *c.* 0.5 mm wide, cream. **Fig. 11.**

***Additional specimens examined*: Queensland.** Cook District: Between Chester River & Leo Creek, 13° 39'S, 143° 26'E, Jul 1978, *Butler 299* (CANB); Gorge of the Chester River, eastern fall of McIlwraith Range, 13° 41'S, 143° 24'E, Jul 1978, *Clarkson 2349* (BRI); Rocky River, 13° 49'S, 143° 28'E, Aug 1997, *Cooper WWC56 & Jensen* (QRS); T.R. 14, Leo Creek Mine area, McIlwraith Range, 13° 44'S, 143° 22'E, Jun 1992, *Forster PIF10164 et al.* (BRI, QRS); Rocky River Scrub, Silver Plains Station, 13° 49'S, 143° 27'E, Jun 1992, *Forster PIF10607 & Tucker* (BRI, MEL, QRS); Lower Station Creek Gorge, McIlwraith Range, 13° 57'S, 143° 19'E, Jun 1997, *Forster PIF21281 et al.* (BRI, MEL, NE); Rocky River, 13° 55'S, 143° 30'E, Sep 1971, *Hyland 5477* (BRI, QRS); T.R. 14 Massy, 13° 52'S, 143° 23'E, Nov 1980, *Hyland 10899* (BRI, CANB, QRS); *loc. cit.*, Nov 1980, *Hyland 10899* (BRI, QRS); McIlwraith Range, near the head of South Massey Creek, 13° 54'S, 143° 19'E, *Le Cussan 227* (QRS); cult. Tolga (ex Leo Creek, track to old mine, 13° 44'S, 143° 22'E), Dec 2004, *Sankowsky 2556 & Sankowsky* (BRI); cult. Tolga (ex Rocky River, 13° 49'S, 143° 27'E), Dec 2004, *Sankowsky 2558 & Sankowsky* (BRI); McIlwraith Range, Oct 1962, *Smith 11789* (BRI); T.R. 14, Rocky River area, 13° 40'S, 143° 25'E, Sep 1973, *Stocker 1042* (BRI, QRS); cult. Kholo (ex Leo Creek, McIlwraith Range, 13° 44'S, 143° 22'E), Jan 2004, *Tucker 3006* (BRI); cult. Kholo (ex Rocky River, Silver Plains, 13° 49'S, 143° 27'E), Jan 2004, *Tucker 4375* (BRI); T.R. 14, McIlwraith Range, 13° 45'S, 143° 20'E, Jul 1977, *Unwin 383* (QRS); Goanna Creek, E of McIlwraith Range, Nov 1956, *Webb 3155* (BRI); Rocky River on eastern foothills of McIlwraith Range, 13° 47'S, 143° 25'E, Oct 1969, *Webb & Tracey 9341 & 9438* (BRI); headwaters of Lankelly Creek on western fall of McIlwraith Range, 13° 52'S, 143° 20'E, Oct 1969, *Webb & Tracey 9554* (BRI); North western fall of McIlwraith Range at head of Peach Creek, 13° 46'S, 143° 16'E, Oct 1969, *Webb & Tracey 9817* (BRI); Lankelly Creek on western fall of McIlwraith Range, 13° 54'S, 143° 20'E, Jun 1971, *Webb & Tracey 11487* (BRI).

***Distribution and habitat*:** *Actephila traceyi* is restricted to the McIlwraith Range on far northern Cape York Peninsula, where it has been found in the catchments of Goanna, Leo, Massey, Peach and Station Creeks and the Chester and Rocky Rivers (**Map 5**). Plants grow at altitudes between 100 and 380 m in 'seasonally dry' rainforest (semi-deciduous, complex notophyll to mesophyll vineforest) along watercourses on alluvium derived from granites or metamorphics or a combination of the two substrates.

***Notes*:** Herbarium collections of *Actephila traceyi* have been usually identified as *A. lindleyi*; however, it differs from that species in the leaf lamina with a greater number of lateral veins (11–16 versus 7–12); the male flowers with much longer pedicels (5–16 versus 1.5–5 mm), sepals that are ovate-spathulate (versus oblong to ovate) and longer (3.5–5 versus 1–3 mm), a disk that is 5-angled (versus rounded); larger fruit (11–15 × 16–24 mm versus 9–12 × 11–13.5 mm); and larger seeds (10–14 × 7–12 mm versus 6–7 × 5–6.5 mm) that are pale olive-green to olive-green (versus dark olive-green).

A probable, undescribed taxon allied to *A. traceyi* has been collected at Bolt Head, Temple Bay and the Nesbit River (Vouchers: 4.5 km SW of the Nesbit River mouth, 57 km NE of Coen, Silver Plains, 13° 13'S, 143° 32'E, Aug 1993, *Fell DGF3448 et al.* (BRI, L); Bolt Head, Temple Bay, 12° 14'S, 143° 04'E, Jun 1996, *Forster PIF19409 et al.* (BRI); North of Beach road, Bolt Head, 12° 15'S, 143° 05'E, Jun 1996, *Gray 6887* (BRI, QRS)) where it occurs in semi-deciduous notophyll vineforest on stabilised sand dunes. These sterile collections differ from *A. traceyi* in the fewer lateral veins in the leaves.

***Conservation status*:** *Actephila traceyi* is commonly encountered throughout its known, albeit restricted range. There is no information available on the area of occupancy or the number of individuals within populations. Populations are not present in any conservation reserves, but are not considered under threat.

***Etymology*:** *Actephila traceyi* is named to honour J.G. (Geoff) Tracey (1930–2004), pioneer ecologist, explorer and plant collector for CSIRO in Australian rainforests. Geoff contributed over 10,000 herbarium collections to the Queensland Herbarium and elsewhere.

13. Actephila venusta P.I.Forst., **sp. nov.** ab *A. lindleyi* (Steud.) Airy Shaw venis in folii lamina abaxiali usque ad tantum ordinibus 1–2 (adversum ordines 1–3), floribus pedicellis longioribus (flores masculi: 5–14 adversum 1.5–5 mm, foeminei: 13–44 adversum 2–14 mm), sepalis ad apicibus non cucullatis (adversum cucullata), disco floris masculi 5-angulato (in illa rotundato), disco floris foeminei maximo (1–1.8 × 4–6 mm adversum 0.5–1 × 2–4 mm) differt.

Typus: Queensland. Cook District: Possum Scrub, road to Stones Crossing from Weipa, 12° 27'S, 142° 09'E, 8 December 1993, *P.I. Forster PIF14372* (holo: BRI [3 sheets + spirit]; iso: A, AD, CANB, DNA, K, L, MEL, NSW).

Actephila sp. (Possum Scrub P.I.Forster PIF14372) (Forster & Henderson 1997: 70; Forster & Halford 2002: 68).

Actephila sp. (Lockerbie WWC 817) (Hyland *et al.* 1999, 2003).

Subshrub or shrub to 4 m high. Indumentum of simple trichomes, ferruginous-tan, entire plant is glabrous unless stated otherwise. Branchlets glossy, fawn-tan, lenticellate with age. Stipules ovate-triangular to triangular, 0.8–2.4 mm long, 0.7–1.8 mm wide, occasionally irregularly crenate. Leaves alternate, subverticillate or subopposite, coriaceous, petiolate; petioles 2–33 mm long, 0.8–1.2 mm wide, olive-green, lenticellate; lamina length/petiole length ratio 3.2–17.7 (n=239); lamina oblanceolate, obovate, rarely elliptic or elliptic-ovate, ± flat, 26–155 mm long, 13–82 mm wide, length/width ratio 1.2–3.3 (n=239); base acute, rarely rounded, often unequal; tip acute or rounded, rarely retuse; midrib above slightly raised (height < 5 times the width), dark green, below strongly raised at lamina base (height < or ± equal to width) then decreasing towards apex, yellow-green; venation brochidodromous, comprising 8–10 lateral veins per side of midrib and intercostal reticulate veins; upper surface dark green and glossy, lateral venation visible, intercostal venation ± obscure; lower surface pale green and glossy, lateral and intercostal venation prominent and slightly raised, 1° and 2° vein orders distinct, 3° vein order indistinct, 4° and onwards vein orders obscure; margin entire, flat to slightly recurved, pale green to yellow-green. Inflorescence an axillary fascicle 1–4 mm diameter, single sex or with both male and female flowers. Male flowers: pedicels filiform, 5–14 mm long, 0.2–0.4 mm diameter; sepals 5, oblong to obovate, 2–5 mm long, 1.2–3 mm wide, densely ciliate in patch at apex; petals absent; disk conspicuous, fleshy, 1–1.5 mm high, 1.5–4 mm diameter, 5-angled; stamens 5, filaments 2–3 mm long, *c.* 0.1 mm diameter, anthers globose-ovoid, *c.* 0.2 mm long and 0.4 mm wide. Female flowers: pedicels filiform, 13–44 mm long, 0.6–1 mm diameter; sepals 5, rarely 6, oblong to obovate, 4.5–6 mm long, 2.5–4.5 mm wide, densely ciliate in patch at apex; petals absent, of if rarely present 1 or 2, spathulate, *c.* 2 mm long and 1 mm wide; disk conspicuous, fleshy, 1–1.8 mm high, 4–6 mm diameter, 5-angled; ovary 2–4.5 mm long, 3.5–5.5 mm diameter; styles 3, simple, shortly connate at base, 0.8–2 mm long, stigmas subcapitate. Fruit: pedicels 13–44 mm long, 0.8–1.2 mm diameter; capsules depressed-globose,

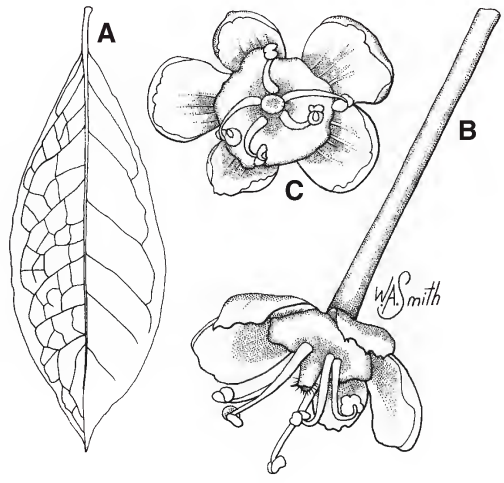


Fig. 12. ***Actephila venusta.*** A. abaxial leaf surface ×0.5. B. side view of male flower ×6. C. face view of male flower ×6. All from *Forster PIF14372* (BRI). Del. W. Smith.

rounded, 8–9 mm long, 12–14 mm diameter, strongly bullate, green to purple-brown; columella 5–6 mm long. Seeds 5–7 mm long, 4–6 mm wide, pale olive green; hilum 1.5–2.5 mm long, caruncle poorly developed, narrow-oblong, 1–2 mm long, 0.2–0.5 mm wide, cream. **Fig. 12.**

***Selected specimens examined*: Northern Territory.** 13 km SW Cape Arnhem, 12° 24'S, 136° 53'E, Feb 1994, *Brennan 2587* (DNA); Marchinbar Island, South Island of Two Island Bay, 11° 04'S, 136° 43'E, Oct 1994, *Brennan 2934* (DNA); Elcho Island, 11° 46'S, 135° 55'E, Dec 1987, *Dunlop 7589* (BRI, DNA, MEL, NSW, QRS); Warangaya, Elcho Island, 11° 56'S, 135° 42'E, Sep 1987, *Russell-Smith 3286 & Lucas* (BRI, DNA); Elcho Island, 14 km SW Naningburra Point, 11° 53'S, 135° 48'E, Dec 1987, *Russell-Smith 4487 & Lucas* (DNA, MEL); NE tip of Elcho Island, 11° 48'S, 135° 56'E, Dec 1987, *Russell-Smith 4498 & Lucas* (BRI, DNA); Gove, Dalywoi Bay, 12° 21'S, 136° 55'E, Feb 1988, *Russell-Smith 4669 & Lucas* (BRI, DNA, NSW, QRS); Elcho Island, 11° 55'S, 135° 50'E, Dec 1987, *Russell-Smith 4518 & Lucas* (BRI, DNA); west bank near mouth of West Alligator River, 12° 15'S, 132° 15'E, May 1978, *Webb & Tracey 12563* (BRI, CANB, DNA). **Queensland.** Cook District: Prince of Wales Island, Torres Strait, 10° 45'S, 142° 15'E, Feb 1975, *Cameron 20132, 20133* (QRS); Pajinka, Cape York, 10° 46'S, 142° 31'E, Feb 2001, *Cooper WWC1479 & Jensen* (BRI, MEL); Mt Bremer, western slopes, 26 km NE of Bamaga, Injinoo custodial land, 10° 42'S, 142° 31'E, Feb 1994, *Fell DGF3922 et al.* (BRI, QRS); Iron Range N.P., 5.8 km SW of Cape Weymouth, 12° 39'S, 143° 23'E, Mar 1994, *Fell DGF4114 & Stanton* (BRI, MEL, QRS); Lake Wicheura, 23 km NE of Bamaga, Injinoo custodial land, 10° 46'S, 142° 33'E, Feb 1994, *Fell DGF4074 & Stanton* (BRI); Muddy Bay, Cape York, 10° 43'S, 142° 33'E, Jun 1994, *Forster PIF15330 & Tucker* (BRI, DNA); Lockerbie Scrub, 10° 47'S, 142° 29'E, Jun 1994, *Forster PIF15334 & Tucker* (BRI, MEL); Mutee Head, Cape York, 10° 54'S, 142° 14'E, Jun 1994, *Forster PIF15352* (BRI, MEL); Turtle Head Is., 10° 56'S, 142° 40'E, May 1995, *Le Cussan 397* (BRI); Yam Island, Torres Strait, 9° 05'S, 142° 46'E, Nov 1999, *Wannan 1486* (BRI).

***Distribution and habitat*:** In Queensland *Actephila venusta* is found from islands in the Torres Strait south to Iron Range. This species is also found in a handful of localities in the Northern Territory (**Map 2**). Plants grow in the understorey of 'dry' rainforests (semi-deciduous to deciduous, complex microphyll to notophyll vineforests) on substrates (alluvial or on ridges) derived from granites, laterised sandstones, metamorphics or sand ridges at altitudes between 30 and 430 m.

***Notes*:** *Actephila venusta* is closely allied to *A. flavescens* and *A. lindleyi* and can be considered a more northerly distributed sister species. Herbarium collections of *A. venusta* have been usually referred to *A. lindleyi*. *Actephila venusta* differs from *A. lindleyi* in the leaf lamina abaxially with 1–2° vein orders distinct (versus 1–3°), the flowers with longer pedicels (male flowers: 5–14 versus 1.5–5 mm; female flowers: 13–44 versus 2–14 mm); sepals that are not cucullate at the apices (versus cucullate); the male flower disk 5-angled (versus rounded) and the female flower disk much larger (1–1.8 × 4–6 mm versus 0.5–1 × 2–4 mm).

Populations of *Actephila venusta* from the driest sites (semi-deciduous microphyll vineforests) in the Northern Territory and western Cape York Peninsula tend to have narrower, more oblanceolate leaves than those from wetter areas (evergreen microphyll to notophyll vineforest) such as at Bamaga.

A probable, undescribed taxon allied to *A. venusta* has been collected in the vicinity of Bathurst Head (Vouchers: 19.5 km ESE of Bathurst Head, Kalpowar Pastoral Holding, 14° 20'S, 144° 21'E, Nov 1992, *Fell DGF2765 & Stanton* (BRI, QRS); 15 km SE of Bathurst Head, 14° 21'S, 144° 17'E, Nov 1992, *Fell DGF2774 & Stanton* (BRI, MEL, QRS); south of Bathurst Bay, 14° 20'S, 144° 20'E, Oct 1970, *Hyland 4841* (BRI, QRS)) where it occurs in 'seasonally dry' rainforest (semi-deciduous complex notophyll vineforest) on granite substrates. These sterile collections differ in the strongly subverticillate foliage with small lamina blades that are about half the length of *A. venusta*.

***Conservation status*:** *Actephila venusta* is widely distributed in areas remote from development. There is no information available on the area of occupancy or the numbers of individuals within populations for this species. *Actephila venusta* is present in Iron Range National Park and is not considered to be threatened.

***Etymology*:** The specific epithet is derived from the Latin word *venustus* (beautiful) and alludes to the flowers of this species.

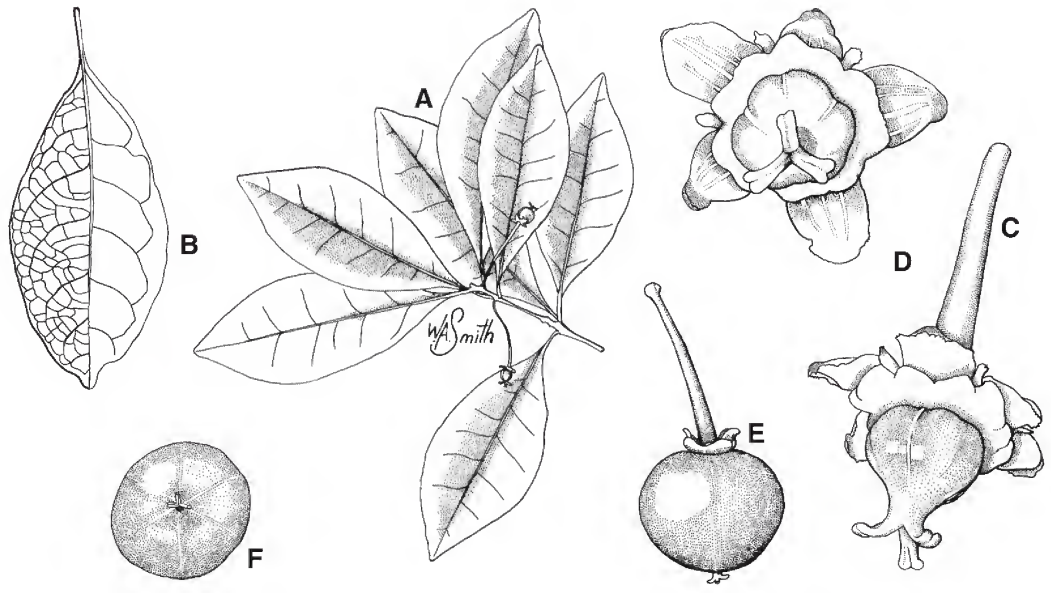


Fig. 13. ***Actephila vernicosa.*** A. habit of flowering branch ×0.5. B. abaxial leaf surface ×0.5. C. side view of female flower ×6. D. face view of flower ×6. E. side view of fruit ×1.5. F. face view of fruit ×1.5. A, B, E, F from *Forster PIF21249* (BRI); C, D from *Cooper WWC1832* (BRI). Del. W. Smith.

---

14. Actephila vernicosa P.I.Forst., **sp. nov.** ab *A. lindleyi* (Steud.) Airy Shaw differt stipulis triangularibus usque truncatis (adversum stipulas triangulari-ovatas) quae minores sunt (0.7–1 × 0.5–0.8 mm adversum 1–1.7 × 0.8–1.5 mm), foliis chartaceis (in illa coriaceis) petiolis atroviridibus (non brunneis usque olivaceis), floribus masculis sepalis obtusis usque obovatis (adversum sepala oblonga usque ovata) disco 5-angulato (adversum rotundato) et frutice trilobato (non rotundato).

Typus: Queensland. COOK DISTRICT: Millaa Millaa Falls, 17° 30'S, 145° 36'E, 23 June 1997, *P.I. Forster PIF21249, R. Jensen & M.C. Tucker* (holo: BRI [1 sheet + spirit]; iso: DNA, MEL, NSW).

Actephila sp. (Millaa Millaa RJ 494) (Hyland *et al.* 1999, 2003).

Actephila sp. (Wooroonooran N.P., P.I.Forster PIF17151) (Forster & Henderson 1997: 70; Forster & Halford 2002: 68).

Subshrub or shrub to 3 m high. Indumentum of simple trichomes, translucent, entire plant is glabrous unless stated otherwise. Branchlets glossy, fawn-tan, lenticellate with age. Stipules triangular to truncate, 0.7–1 mm long, 0.5–0.8 mm wide. Leaves alternate or subverticillate, chartaceous, petiolate; petioles 3–8 mm long, 0.8–1 mm wide, black-green, lenticellate; lamina length/petiole length ratio 7.4–16.8 (n=322); lamina elliptic, obovate, oblanceolate, rarely orbicular, ± flat, 20–90 mm long, 11–50 mm wide, length/width ratio 1.3–3.3 (n=322); base attenuate to cuneate; tip acute, obtuse or rounded; midrib above slightly raised (height < 5 times the width), dark green, below strongly raised at lamina base (height < width) then decreasing towards apex, pale yellow-green; venation brochidodromous, comprising 6–9 lateral veins per side of midrib and intercostal reticulate veins; upper surface dark green and glossy, lateral venation visible, intercostal venation ± obscure; lower surface pale green and glossy, lateral and intercostal venation prominent and slightly raised, 1–3° vein orders distinct, 4° and 5° vein orders indistinct, 6° and onwards vein orders obscure; margin entire, flat, pale green. Inflorescence an axillary fascicle 0.5–

1.5 mm diameter, single sex or with both male and female flowers. Male flowers: pedicels filiform, 4–7 mm long, 0.3–0.5 mm diameter; sepals 5, obtuse to obovate, 1.8–2 mm long, 1–1.5 mm wide, ciliate in patches towards apices; petals absent; disk conspicuous, fleshy, *c.* 0.5 mm high, 1.5–2.5 mm diameter, 5-angled; stamens 4 or 5, filaments 1–2 mm long, 0.1–0.2 mm diameter, anthers globose-ovoid, 0.3–0.5 mm long, 0.2–0.4 mm wide. Female flowers: pedicels filiform, 5–25 mm long, 0.5–0.7 mm diameter; sepals 5, obtuse to ovate, 2–2.8 mm long, 1.4–2 mm wide, ciliate in patches towards the apices; petals absent; disk conspicuous, fleshy, 0.8–1 mm high, 3–4.5 mm diameter, 5-angled; ovary 1.5–3.5 mm long, 1.5–3.5 mm diameter; styles 3, simple, shortly connate at base, 0.8–1.8 mm long, stigmas subcapitate. Fruit: pedicels 18–22 mm long, 0.8–2 mm diameter; capsules depressed-globose to subglobose, trilobate, 12–17 mm long, 10–13 mm diameter, strongly bullate, green; columella 5–6 mm long. Seeds 7–8 mm long, 6–7 mm wide, pale tan to olive green; hilum *c.* 2 mm long, caruncle absent. **Fig. 13.**

***Additional specimens examined*: Queensland.** Cook District: Westcott road, Topaz, 17° 24'S, 145° 41'E, May 1993, *Cooper WWC539, 540 & Cooper* (QRS); *loc. cit.*, Nov 1995, *Cooper WWC957 & Cooper* (QRS); *loc. cit.*, Dec 1995, *Cooper WWC958 & Cooper* (QRS); *loc. cit.*, Oct 1996, *Cooper WWC1064 & Cooper* (BRI, QRS); *loc. cit.*, Dec 2003, *Cooper WWC1832 & Cooper* (BRI); Stockwellia Site, Boonjee, 17° 25'S, 145° 45'E, Jun 1995, *Cooper WWC946 & Cooper* (QRS); F.R.185 Robson's L.A., near Danbulla, Mar 1961, *Dansie 2027* (BRI); Danbulla F.R. 185, Aug 1962, *Dansie 2397* (BRI); Scenic Reserve, Millaa Millaa Falls, Sep 1982, *Dansie AFO5219* (QRS); Stockwellia track, Wooroonooran N.P., 17° 22'S, 145° 45'E, Jul 1995, *Forster PIF17151 & Figg* (BRI, MEL); Wooroonooran N.P., Gourka road (old Windin L.A.), 17° 22'S, 145° 42'E, Dec 2003, *Forster PIF29778 & Jensen* (BRI, MEL); Stockwellia track, Boonjee, 17° 23'S, 145° 44'E, Jul 1995, *Hunter JH5287* (BRI); East slopes of Mt Bartle Frere along the Falchetti track to the Mitchell Bomber Crash Site, 17° 22'S, 145° 51'E, Jul 2001, *Jago 6009 & Gandini* (A, BRI, L, MEL, NE, NSW); Millaa Millaa Falls, 17° 30'S, 145° 36'E, Dec 1995, *Jensen 494* (QRS); S.F.R. 185, Maunder L.A., 17° 10'S, 145° 35'E, May 1972, *Nicholson s.n.* (QRS28440); cult. Tolga (ex Boonjee), Apr 1997, *Sankowsky 1558 & Sankowsky* (BRI); *loc. cit.*, Dec 2004, *Sankowsky 2559 & Sankowsky* (BRI); Millaa Millaa Falls, 17° 31'S, 145° 37'E, Feb 1986, *Shapcott s.n.* (BRI [AQ451830]); VCL, Bartle Frere, E of Glen Allyn Trig., Feb 1962, *Webb & Tracey 5799* (BRI).

***Distribution and habitat*:** *Actephila vernicosa* is restricted to a small area bordered by the hamlets or localities of Bartle Frere, Danbulla forestry, Boonjee and Topaz in the 'Wet Tropics' bioregion of north-eastern Queensland (**Map 2**). Plants occur as small shrubs or subshrubs in the understorey of 'wet' rainforest (evergreen, complex notophyll vineforest) on red soil derived from basalt or occasionally from granite, at altitudes between 600 and 800 m.

***Notes*:** *Actephila vernicosa* is an insignificant plant that has been usually misidentified as *A. lindleyi* in herbaria. The population from Millaa Millaa Falls was one of the five populations included in the allozyme study of *A. lindleyi s.l.* by Shapcott (1998) where it was found to be significantly different from the others (now variously identified as *A. grandifolia* and *A. lindleyi*).

Actephila vernicosa is distinctive among the Australian species of the genus in the small, highly glossy, chartaceous leaves and the short blackish-green petioles. It appears to be allied to *A. lindleyi* but differs from that species in the triangular to truncate stipules (versus triangular-ovate) that are smaller (0.7–1 × 0.5–0.8 mm versus 1–1.7 × 0.8–1.5 mm), the chartaceous leaves (versus coriaceous) with black-green petioles (versus brown to olive-green); the male flowers with obtuse to obovate sepals (versus oblong to ovate) and a 5-angled disk (versus rounded); and the trilobate fruit (versus rounded).

***Conservation status*:** *Actephila vernicosa* has a restricted distribution, but is locally common in its known localities. There is no available information as to the area of occupancy or the numbers of individuals within populations. Nearly all populations are present in National Parks (Wooroonooran) or State Forests (S.F. 185 Danbulla) and are not presently under threat.

***Etymology*:** The specific epithet is derived from the Latin word *vernicosus* (varnished) and alludes to the glossy leaves of this species.

Excluded Names

Actephila mearsii C.T.White, *Proc. Royal Soc. Queensland* 50: 85 (1939).

Base name for **Peripentadenia mearsii** (C.T.White) L.S.Sm. (Elaeocarpaceae). *Actephila mearsii* was still listed as a valid species in the genus by Govaerts *et al.* (2000).

Acknowledgements

I wish to thank –

R. Booth (BRI), W. & W.T. Cooper, R. Jensen, G. Leiper, W. McDonald (BRI), W. Takeuchi (LAE), G. Sankowsky, G. Smyrell and M.C. Tucker for assistance during fieldwork where collections of *Actephila* were made, or for making special collections of material.

Will Smith (BRI) for the illustrations that were funded by the Australian Biological Resources Study (ABRS), along with some funding for production of a 'Flora of Australia' treatment.

Peter Bostock (BRI) for translation of the diagnoses into Latin.

Alex George, Gordon Guymer (BRI) and Annette Wilson (ABRS) who whilst Australian Botanical Liaison Officers at the Royal Botanic Gardens, Kew, located and photographed various types.

The herbaria CANB, DNA, MEL, NSW, PR and QRS for the loan of specimens.

Peter van Welzen (L) for assistance with examination of types at L and U, and for providing the unpublished account of *Actephila* for the Flora of Thailand.

References

Airy Shaw, H.K. (1971). Notes on Malesian and other Asiatic Euphorbiaceae. *Kew Bulletin* 25: 473–556.

Airy Shaw, H.K. (1978). Notes on Malesian and other Asiatic Euphorbiaceae. *Kew Bulletin* 32: 361–418.

Airy Shaw, H.K. (1980a). The Euphorbiaceae of New Guinea. *Kew Bulletin Additional Series* 8: 1–243.

Airy Shaw, H.K. (1980b). New or noteworthy Australian Euphorbiaceae II. *Muelleria* 4: 207–241.

Airy Shaw, H.K. (1980c). An alphabetical checklist of native Australian Euphorbiaceae (excluding *Phyllanthus*, *Euphorbia*, and the Stenolobeae). *Muelleria* 4: 243–245.

Airy Shaw, H.K. (1981). A partial synopsis of the Euphorbiaceae Platylobeae of Australia (excluding *Phyllanthus*, *Euphorbia* and *Calycopeplus*). *Kew Bulletin* 35: 577–700.

Apg (The Angiosperm Phylogeny Group). (2003). An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG II. *Botanical Journal of the Linnean Society* 141: 399–436.

Ash, A., Ellis, B., Hickey, L.J., Johnson, K., Wilf, P. & Wing, S. (1999). *Manual of Leaf Architecture.* Smithsonian Institution: Washington.

Baillon, H. (1866a). Species Euphorbiacearum Euphorbiacées Australiennes. *Adansonia* 6: 280–344.

Baillon, H. (1866b). Étude sur les *Actephila* Australiens. *Adansonia* 6: 360–367.

Baillon, H. (1866c). Sur la parthénogenèse et la suppression du genre *Caelebogyne. Adansonia* 6: 368–379.

Bawa, K.S. (1980). Evolution of dioecy in flowering plants. *Annual Review of Ecology and Systematics* 11: 15–39.

Bentham, G. (1873). Euphorbiaceae. *Flora Australiensis* 6: 41–153. L.Reeve & Co.: London.

Berg, R.Y. (1975). Fruit, seed, and myrmecochorous dispersal in *Micrantheum* (Euphorbiaceae). *Norwegian Journal of Botany* 22: 173–194.

Bicknell, R.A. & Koltunow, A.M. (2004). Understanding apomixis: recent advances and remaining conundrums. *The Plant Cell* 16: S228–S248.

Blume, C.L. (1825). *Bijdragen tot de Flora van Nederlandsch Indië.* Ter Lands Drukkerij: Batavia.

Bossart, J.L. & Prowell, D.P. (1998). Genetic estimates of population structure and gene flow: limitations, lessons and new directions. *Trends in Ecology & Evolution* 13: 202–206.

Brock, J. (1988). *Top End Native Plants.* J. Brock: Darwin.

Butler, D.W. (2003). Seed dispersal syndromes and the distribution of woody plants in south-east Queensland's vine-forests. Ph.D. thesis. University of Queensland: St Lucia.

Cain, M.L., Milligan, B.G. & Strand, A.E. (2000). Long-distance dispersal in plant populations. *American Journal of Botany* 87: 1217–1227.

Calvert, G.A., Lokkers, C. & Cumming. R. (2005). *Rare and Threatened Plants of the Townsville Thuringowa Region.* Coastal Dry Tropics Landcare Inc.: Townsville.

Charlesworth, D. (1984). Androdioecy and the evolution of dioecy. *Biological Journal of the Linnean Society* 23: 333–348.

Charlesworth, D. (1993). Why are unisexual flowers associated with wind pollination and unspecialized pollinators? *American Naturalist* 141: 481–490.

Chase, M.W., Zmartzty, S., Lledo, M.D., Wurdack, K.J., Swensen, S.M. & Fay, M.F. (2002). When in doubt, put it in Flacourtiaceae: a molecular phylogenetic analysis based on plastid *rbcL*

DNA sequences. *Kew Bulletin* 57: 141–181.

Chayamarit, K. in press. *Actephila*. *Flora of Thailand*.

Cooper, W. & Cooper, W.T. (2004). *Fruits of the Tropical Australian Rainforest*. Nokomis Editions Pty Ltd.: Melbourne.

Crawford, D.J. (1989). Enyzme electrophoresis and plant systematics. In D.E. Soltis & P.S. Soltis (eds.), *Isozymes in Plant Biology*. Dioscorides Press: Portland, Oregon.

Cronquist, A. (1988). *The Evolution and Classification of Flowering Plants*, 2nd edition. New York Botanical Garden: Bronx, New York.

Dalzell, N.A. (1851). Contributions to the botany of Western India. *Hooker's Journal of Botany* 3: 225–233.

Endress, P.K. (1994). *Diversity and Evolutionary Biology of Tropical Flowers*. Cambridge University Press: Cambridge.

Esser, H.-J. (2003). Fruit characters in Malesian Euphorbiaceae. *Telopea* 10: 169–177.

Floyd, A.G. (1989). *Rainforest Trees of Mainland South eastern Australia.* Inkata Press: Melbourne & Sydney.

Floyd, A.G. (1991). Natural regeneration of rainforest in N.S.W. In S. Phillips (ed.), *Rainforest Remnants*, pp. 20–25. NSW National Parks and Wildlife Service: Hurstville.

Forster, P.I. (1994a). *Wetria australiensis* sp. nov. (Euphorbiaceae), a new generic record for Australia. *Austrobaileya* 4: 139–143.

Forster, P.I. (1994b). A taxonomic revision of *Acalypha* L. (Euphorbiaceae) in Australia. *Austrobaileya* 4: 209–226.

Forster, P.I. (1994c). Revision of *Euphorbia plumerioides* Teijsm. ex Hassk. (Euphorbiaceae) and allies. *Austrobaileya* 4: 245–264.

Forster, P.I. (1994d). A taxonomic revision of *Tragia* (Euphorbiaceae) in Australia. *Australian Systematic Botany* 7: 377–383.

Forster, P.I. (1995a). *Sankowskya*, a new genus of *Euphorbiaceae* (Dissiliariinae) from the Australian Wet Tropics. *Austrobaileya* 4: 329–335.

Forster, P.I. (1995b). *Omphalea celata*, a new species of Euphorbiaceae from central Queensland. *Austrobaileya* 4: 381–385.

Forster, P.I. (1996a). A taxonomic revision of *Aleurites* J.R.Forst. & G.Forst. (Euphorbiaceae) in Australia and New Guinea. *Muelleria* 9: 5–13.

Forster, P.I. (1996b). A taxonomic revision of *Dissiliaria* F.Muell. ex Baill. (Euphorbiaceae). *Austrobaileya* 4: 9–27.

Forster, P.I. (1997a). A taxonomic revision of *Austrobuxus* Miq. (Euphorbiaceae: *Dissiliarinae*) in Australia. *Austrobaileya* 4: 619–626.

Forster, P.I. (1997b). A taxonomic revision of *Drypetes* Vahl (Euphorbiaceae) in Australia. *Austrobaileya* 4: 477–494.

Forster, P.I. (1999a). A taxonomic revision of *Bridelia* Willd. (Euphorbiaceae) in Australia. *Austrobaileya* 5: 405–419.

Forster, P.I. (1999b). A taxonomic revision of *Mallotus* Lour. (Euphorbiaceae) in Australia. *Austrobaileya* 5: 457–497.

Forster, P.I. (2003). A taxonomic revision of *Croton* L. (Euphorbiaceae) in Australia. *Austrobaileya* 6: 349–436.

Forster, P.I. (2004). Book Review – "Hyland, B.P.M. et al: Australian tropical rain forest plants. Trees, Shrubs and Vines. CD-ROM and Manual". *Plant Systematics & Evolution* 247: 255–258.

Forster, P.I. & Halford, D.A. (2002). Euphorbiaceae. In R.J.F. Henderson (ed.), *Names and Distribution of Queensland Plants, Algae and Lichens*, pp. 68–74. Environmental Protection Agency: Brisbane.

Forster, P.I. & Henderson, R.J.F. (1997). Euphorbiaceae. In R.J.F. Henderson (ed.), *Queensland Plants Names and Distribution,* pp. 69–76. Department of Environment: Brisbane.

Forster, P.I. & Van Welzen, P. (1999). The Malesian species of *Choriceras*, *Fontainea* and *Petalostigma* (Euphorbiaceae). *Blumea* 44: 99–107.

Forster, P.I., Bostock, P.D., Bird, L.H. & Bean, A.R. (1991). *Vineforest Plant Atlas for South east Queensland.* Queensland Herbarium: Brisbane.

Goosem, S., Morgan, G. & Kemp, J. (1999). Wet Tropics. In P.S. Sattler & R.D. Williams (eds.), *The Conservation Status of Queensland's Bioregional Ecosystems,* pp. 7(1–74). Environmental Protection Agency: Brisbane.

Govaerts, R., Frodin, D.G. & Radcliffe-Smith, A. (2000). *World Checklist and Bibliography of Euphorbiaceae 1 (with Pandaceae).* Royal Botanic Gardens: Kew.

Gross, C.L. (2005). A comparison of the sexual systems in the trees from the Australian tropics with other tropical biomes – more monoecy but why? *American Journal of Botany* 92: 907–919.

Halford, D.A. & Henderson, R.J.F. (2002a). Studies in Euphorbiaceae A.L.Juss. *sens. lat.* 3. A revision of *Bertya* Planch. (*Ricinocarpeae* Müll.Arg., *Bertyinae* Müll.Arg.). *Austrobaileya* 6: 187–245.

Halford, D.A. & Henderson, R.J.F. (2002b). Studies in Euphorbiaceae A.L.Juss. *sens. lat.* 4. A revision of *Monotaxis* Brongn. (*Acalyphoideae* Ascherson, *Ampereae* Müll.Arg.). *Austrobaileya* 6: 273–292.

Halford, D.A. & Henderson, R.J.F. (2003). Studies in Euphorbiaceae A.L.Juss. *sens. lat.* 5. A revision of *Pseudanthus* Sieber ex Spreng. and *Stachystemon* Planch. (*Oldfieldioideae* Köhler & Webster, *Caletieae* Müll.Arg.). *Austrobaileya* 6: 497–532.

Hauser, J. & Blok, J. (1998). *Fragments of Green.* 2nd

edition. Australian Rainforest Conservation Society: Bardon.

Hewson, H. (1988). *Plant Indumentum. A Handbook of Terminology*. Australian Flora & Fauna Series No. 9. Australian Government Publishing Service: Canberra.

Hickley, L.J. (1973). Classification of the architecture of dicotyledonous leaves. *American Journal of Botany* 60: 17–33.

Hickey, M. & King, C. (2000). *The Cambridge Illustrated Glossary of Botanical Terms*. Cambridge University Press: Cambridge.

Hyland, B.P.M., Whiffin, T., Christophel, D.C., Gray, B., Elick, R.W. & Ford, A.J. (1999). *Australian Tropical Rain Forest Trees and Shrubs*. CSIRO Publishing: Melbourne.

Hyland, B.P.M., Whiffin, T., Christophel, D.C., Gray, B., & Elick, R.W. (2003). *Australian Tropical Rain Forest Plants. Trees, Shrubs and Vines*. CD-ROM. CSIRO Publishing: Melbourne.

Iucn (2001). *IUCN Red List Categories and Criteria. Version 3.1*. IUCN – The World Conservation Union: Gland, Switzerland/Cambridge, U.K.

James, T.A. & Harden, G.J. (1990). Euphorbiaceae. In G.J. Harden (ed.), *Flora of New South Wales* 1: 389–430. New South Wales University Press: Kensington (Sydney).

Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.F. & Donoghue, M.J. (2002). *Plant Systematics – a phylogenetic approach*. 2nd edition. Sinauer Associates Inc.: Sunderland, Massachusetts.

Kitching, R.L., Bickel, D., Creagh, A.C., Hurley, K. & Symonds, C. (2004). The biodiversity of Diptera in Old World rain forest surveys: a comparative faunistic analysis. *Journal of Biogeography* 31: 1185–1200.

Korpelainen, H. (1998). Labile sex expression in plants. *Biological Review* 73: 157–180.

Laidlaw, M.J., Olsen, M.J., Kitching, R.L. & Greenway, M. (2000). Tree floristics and structural characteristics of one hectare of subtropical rainforest in Lamington National Park, Queensland. *Proceedings of the Royal Society of Queensland* 109: 91–105.

Levin, D.A. (1979). The nature of plant species. *Science* 204: 381–384.

Levin, D.A. (2000). *The Origin, Expansion, and Demise of Plant Species*. Oxford University Press: Oxford.

Levin, G.A. (1986a). Systematic foliar morphology of Phyllanthoideae (Euphorbiaceae). I. Conspectus. *Annals of the Missouri Botanical Garden* 73: 29–85.

Levin, G.A. (1986b). Systematic foliar morphology of *Phyllanthoideae* (Euphorbiaceae). II. Phenetic analysis. *Annals of the Missouri Botanical Garden* 73: 86–98.

Levin, G.A. (1986c). Systematic foliar morphology of *Phyllanthoideae* (Euphorbiaceae). III. Cladistic analysis. *Systematic Botany* 11: 515–530.

Li, P.T. & Hoffmann, P. in press. *Actephila*. *Flora of China*.

Lloyd, D.G. (1982). Selection of combined versus separate sexes in seed plants. *American Naturalist* 120: 571–585.

Mennega, A.M. (1987). Wood anatomy of the Euphorbiaceae, in particular of the subfamily Phyllanthoideae. *Botanical Journal of the Linnean Society* 94: 111–126.

Mills, K. & Jakeman, J. (1995). *Rainforests of the Illawarra District*. Coachwood Publishing: Jamberoo.

Miquel, F.A.W. (1859). *Florae Indiae Batavae*. 1(2): 356. C.G. van der Post: Amsterdam.

Müller, J. (1865). Euphorbiaceae. Vorläufige Mittheilungen aus dem für De Candolle's Prodromus bestimmten Manuscript über diese familie. *Linnaea* 34: 1–224.

Müller, J. (1866). Euphorbiaceae. In A.L.L.P. de Candolle (ed.), *Prodromus Systematis Naturalis Regni Vegetabilis* 15(2): 189–1260. Masson: Paris.

Pax, F. & Hoffman, K. (1922). Euphorbiaceae-Phyllantheae. In A. Engler (ed.), *Das Pflanzenreich* Heft 81: 1–349. Wilhelm Engelmann: Berlin.

Pax, F. & Hoffman, K. (1931). Euphorbiaceae. In A. Engler & H. Harms (eds.), *Die Natürlichen Pflanzenfamilien*, 2nd edition, 19c: 11–251. Wilhelm Engelmann: Leipzig.

Philcox, D. (1997). Euphorbiaceae. In M.D. Dassanayake & W.D. Clayton (eds.), *A Revised Handbook to the Flora of Ceylon*. 11: 80–283. A.A. Balkema: Rotterdam.

Primack, R.B. & Miao, S.L. (1992). Dispersal can limit local plant distribution. *Conservation Biology* 6: 513–519.

Radcliffe-Smith, A.R. (2001). *Genera Euphorbiacearum*. Royal Botanic Gardens: Kew.

Renner, S.S. & Feil, J.P. (1993). Pollinators of tropical dioecious angiosperms. *American Journal of Botany* 80: 1100–1107.

Richardson, C.R. & Clay, K. (2001). Sex-ratio variation among *Arisaema* species with different patterns of gender diphasy. *Plant Species Biology* 16: 139–149.

Samuel, R., Kathriarachchi, H., Hoffman, P., Barfuss, M.H.J., Wurdack, K.J., Davis, C.C. & Chase, M.W. (2005). Molecular phylogenetics of

Phyllanthaceae: evidence from plastid MATK and nuclear PHYC sequences. *American Journal of Botany* 92: 132–141.

SCHULZ, M. (2000). Roosts used by the golden-tipped bat *Kerivoula papuensis* (Chiroptera: Vespertilionidae). *Journal of Zoology (London)* 250: 467–478.

SHAPCOTT, A. (1998). Taxonomy, genetics and conservation: a preliminary study of the variation in *Actephila lindleyi* (Euphorbiaceae) a rainforest shrub. *Pacific Conservation Biology* 4: 105–110.

SHARMA, I.K., JONES, D.L., FORSTER, P.I. & YOUNG, A.G. (1998). The extent and structure of genetic variation in the *Macrozamia pauli guilielmi* complex (Zamiaceae). *Biochemical Systematics & Ecology* 26: 45–54.

SHARMA, I.K., JONES, D.L., FORSTER, P.I. & YOUNG, A.G. (1999). Low isozymic differentiation among five species of the *Macrozamia heteromera* group (Zamiaceae). *Biochemical Systematics & Ecology* 27: 67–77.

SHARMA, I.K., JONES, D.L. & FORSTER, P.I. (2004). Genetic differentiation and phenetic relatedness among seven species of the *Macrozamia plurinervia* complex (Zamiaceae). *Biochemical Systematics & Ecology* 32: 313–327.

SMITH, J. (1841). Notice of a plant which produces perfect seeds without any apparent action of pollen. *The Transactions of the Linnean Society of London* 18: 509–512.

STACE, C.A. (1989). *Plant Taxonomy and Biosystematics*. 2nd edition. Edward Arnold: London, Melbourne, Auckland.

STANLEY, T.D. (1983). Euphorbiaceae. In T.D. Stanley & E.M. Ross (eds.), *Flora of South-eastern Queensland*. 1: 406–439. Queensland Department of Primary Industries: Brisbane.

STEARN, W.T. (ed.) (1999). *John Lindley 1799–1865 Gardner - Botanist and Pioneer Orchidologist*. Antique Collectors' Club Ltd.: Woodbridge, Suffolk.

STEBBINS, G.L. (1950). *Variation and Evolution in Plants*. Columbia University Press: New York.

STEUDEL, E.G. (1841). *Nomenclator botanicus*. 2nd edition. J.G. Cottae: Stuttgart.

STUESSY, T.F. (1990). *Plant Taxonomy*. Columbia University Press: New York.

THOMSON, J.D., SHIVANNA, K.R., KENRICK, J. & KNOX, R.B. (1989). Sex expression, breeding system, and pollen biology of *Ricinocarpos pinifolius*: a case of androdioecy? *American Journal of Botany* 76: 1048–1059.

TOKUOKA, T. & TOBE, H. (1995). Embryology and systematics of Euphorbiaceae *sens. lat.*: a review and perspective. *Journal of Plant Research* 108: 97–106.

TOKUOKA, T. & TOBE, H (2001). Ovules and seeds in subfamily *Phyllanthoideae* (Euphorbiaceae): structure and systematic implications. *Journal of Plant Research* 114: 75–92.

TUCKER, N.I.J. & SIMMONS, T.M. (2004). Animal-plant interactions in tropical restoration: observations and questions from north Queensland. In J.Kanowski, C.P.Catterall, A.J.Dennis & D.A.Westcott (eds.), *Animal-Plant Interactions in Rainforest Conservation and Restoration*, pp. 30–33. Rainforest CRC: Cairns.

TURNER, I.M. (2001). *The Ecology of Trees in the Tropical Rain Forest*. Cambridge University Press: Cambridge.

VAN STEENIS, C.G.G.J. (1957). Specific and infraspecific delimitation. *Flora Malesiana*, ser. I, 5: CLXVII–CCXXIX.

WEBB, L.J. (1978). A general classification of Australian rainforests. *Australian Plants* 9: 349–363.

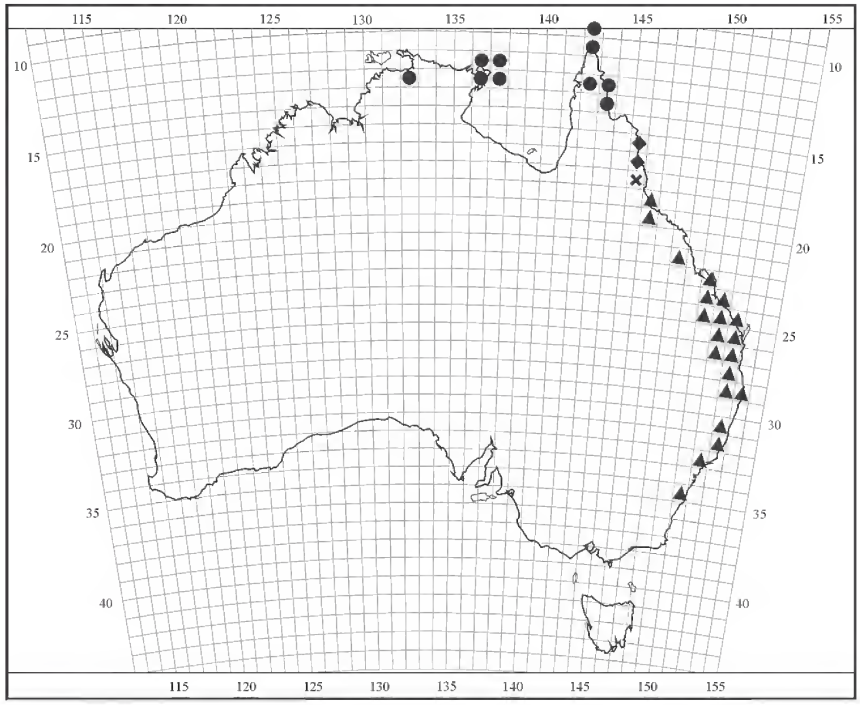
WEBB, L.J. & TRACEY, J.G. (1981). Australian rainforests: pattern and change. In A. Keast (ed.), *Ecological Biogeography of Australia*, pp. 605–694. W. Junk: The Hague.

WEBSTER, G.L. (1994). Synopsis of the genera and suprageneric taxa of Euphorbiaceae. *Annals of the Missouri Botanical Garden* 81: 33–144.

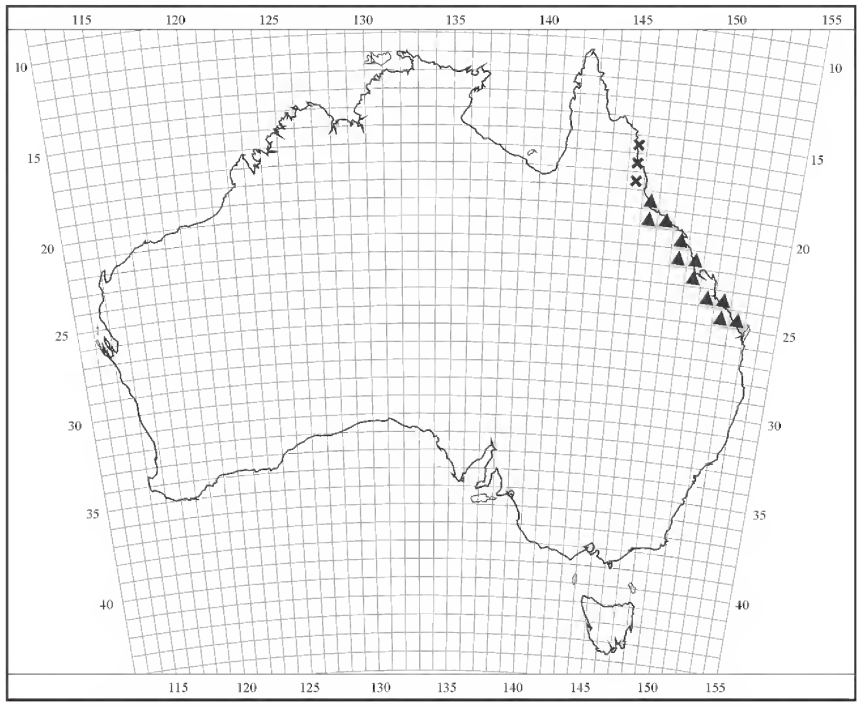
WILLIAMS, G.A. & ADAM, P. (1997). The composition of the bee (Apoidea: Hymenoptera) fauna visiting flowering trees in New South Wales lowland subtropical rainforest remnants. *Proceedings of the Linnean Society of New South Wales* 118: 69–95.

WILLIAMS, G.A. & ADAM, P. (1999). Pollen sculpture in subtropical rain forest plants: is wind pollination more common than previously suspected? *Biotropica* 31: 520–524.

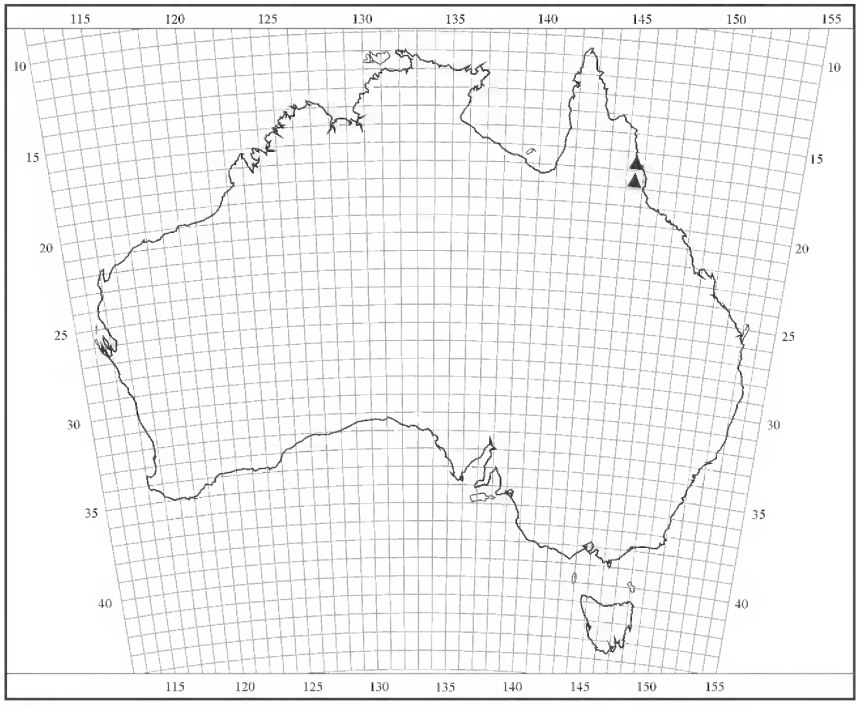
WURDACK, K.J., HOFFMAN, P., SAMUEL, R., DE BRUIJN, A., VAN DER BANK, M. & CHASE, M.W. (2004). Molecular phylogenetic analysis of Phyllanthaceae (*Phyllanthoideae* pro parte, Euphorbiaceae *sensu lato*) using plastid *rbcl* DNA sequences. *American Journal of Botany* 91: 1882–1900.



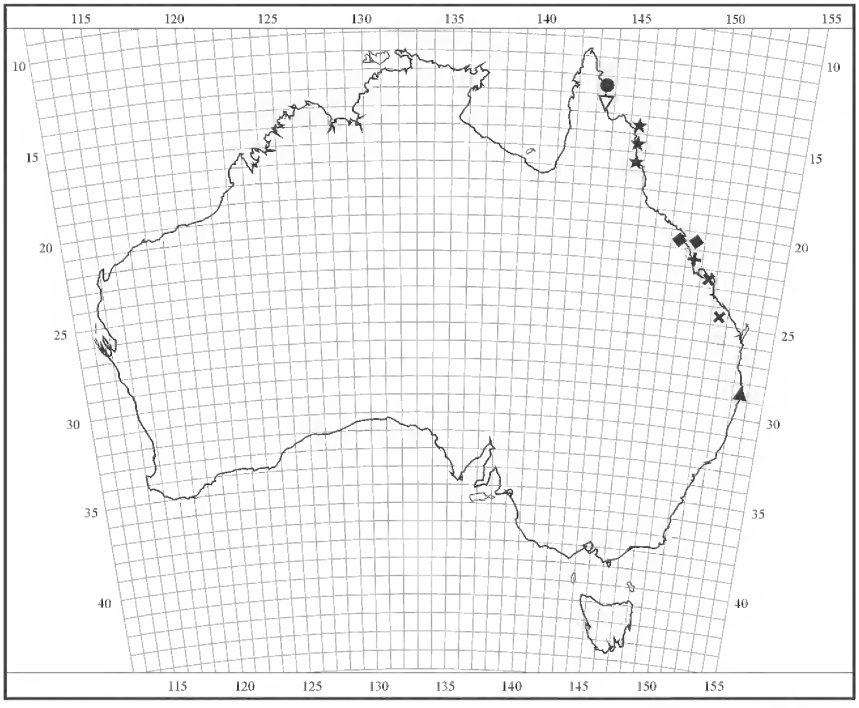
Map 2. Distribution in 1° grids in Australia for *Actephila lindleyi* ▲ , *Actephila venusta* ● , *Actephila flavescens* ◆ , *Actephila vernicosa* ✖ .



Map 3. Distribution in 1° grids in Australia for *Actephila sessilifolia* ▲ and *Actephila petiolaris* ✖ .



Map 4. Distribution in 1° grids in Australia for *Actephila foetida* ▲ .



Map 5. Distribution in 1° grids in Australia for *Actephila bella* ✖ , *Actephila championiae* ✚ , *Actephila grandifolia* ▲ , *Actephila latifolia* ★ , *Actephila longipedicellata* ● , *Actephila plicata* ◆, *Actephila traceyi* ▽ .

Studies in Australian Myrsinaceae: *Tapeinosperma* Hook.f.

Betsy R. Jackes

Summary

Jackes B.R. (2005). Studies in Australian Myrsinaceae: *Tapeinosperma* Hook.f. *Austrobaileya* 7(1): 99–110. In Australia, there are three species recognised in the genus *Tapeinosperma*. One new species *T. pallidum* Jackes is from North Queensland and one new combination and reinstatement, *T. repandulum* (F.Muell.) Jackes, is a species that occurs in southern Queensland and northern New South Wales. Descriptions, an identification key, illustrations and distribution maps are provided for each species.

Key Words: Myrsinaceae, *Tapeinosperma*, *Tapeinosperma pallidum*, *Tapeinosperma repandulum*, Australian flora.

B.R. Jackes, School of Tropical Biology, James Cook University, Townsville, Queensland 4811, Australia.

Introduction

Currently in the genus *Tapeinosperma* Hook.f. more than 60 species are recognised. However, Pipoly and Takeuchi (2004) estimate that there are about 100 species with many undescribed. The distribution of described species ranges from Indonesia east to Fiji and south to Australia and New Caledonia, with more than half of the species occurring in the latter area. Although species have been described for the Philippines these have all been transferred to *Ardisia* Sw. (Stone 1989).

In Australia, two species now placed in the genus *Tapeinosperma* were initially recognised and described as belonging to the genus *Ardisia*. In 1902, Mez combined these two species (*A. pseudojambosa* F.Muell. and *A. repandulam* F.Muell.) and transferred them to *Tapeinosperma* as *T. pseudojambosa*. In addition, he transferred the species described as *Embelia flückigeri* F.Muell., to *Tapeinosperma*. Reynolds (1991) when undertaking a revision of *Embelia* considered that Mez was correct in transferring *E. flückigeri* to *Tapeinosperma*. However, this species, which is known only from the type collection, does not fit the genus as currently circumscribed. The flowers are unisexual rather than bisexual and the stamens are free from the corolla or almost, rather than the upper portion only being free. As noted by Smith (1973) and Sleumer (1988) *Tapeinosperma* is difficult to distinguish from a number of other genera in the Myrsinaceae unless the material is flowering. In New Guinea, vegetative specimens can be easily confused with *Ardisia*, *Discocalyx* Mez, *Fittingia* Mez and *Loheria* Merr. Both *Ardisia* and *Tapeinosperma* have bisexual flowers rather than the unisexual flowers found in the other genera; however, flowers in *Discocalyx* may appear bisexual at times when the aborted organs are still reasonably well-developed. Hence the only reliable character separating all the species in these three genera, is the nature of the filament. In *Tapeinosperma* the apical portion is ligulate and free from the corolla; in *Discocalyx* it is absent or fused to the corolla (Smith 1973), but in *Ardisia* the filaments are free or only fused at the base to form a minute tube which is adnate to the corolla or the anthers are sessile or almost so. In addition, *Tapeinosperma* can be distinguished from *Ardisia* by the ovules being uniseriate rather than multiseriate as found in most species of *Ardisia*; however, this distinction is not clear cut for Australian species of *Ardisia*. In most non-Australian species of *Tapeinosperma* the stigma is obvious, however in the three Australian species the stigma is punctiform and similar to *Ardisia* stigmas. Species belonging to these two genera in Australia can be readily distinguished by the nature of the inflorescence and the shape of the corolla.

In Australia, the species of *Tapeinosperma* are distinguished from all other species of Myrsinaceae by the following combination of characters: inflorescence

Accepted for publication 11 July 2005

paniculate; flowers bisexual; corolla fused at the base to form a tube; staminal filaments short but upper portion free and ligulate; ovules uniseriate, style slender with a punctiform stigma and fruit 1-seeded (many-seeded in *Maesa* which is now in a separate family Maesaceae (Anderberg *et al.* 2000)).

Materials and Methods

This study was based on an examination of morphological characters derived from herbarium material as well as some fresh material. Herbarium specimens examined were from the following Herbaria: BRI, CANB, K, L, MEL, MO, NSW, QRS. All measurements were based on dried material although some flowers were reconstituted in boiling water prior to examination. Secretory structures of a schizogenous origin are present in the various organs and were observed both with a hand lens and under a microscope. These structures which are referred to here as glands, vary in shape and colour between species but appear to be constant within a species. In thicker leaves the pellucid glands may appear orange-coloured or reddish if neighbouring cells are damaged, as by insects. These cells are not to be confused with the small globular deep red glands which only occur in one species (*T. pseudojambosa*). A detailed description of these structures is given in Otegui *et al.* (1998) and Jackes (2005). Areole terminology is as described by Hickey (1973). Trichomes were examined by light microscopy and the basic structure confirmed by SEM. Three types were recorded: uniseriate 2-3 celled; capitate 'scales' sunken into the surrounding epidermis (**Fig. 1b**), (although not tested, some of these appeared to be secretory and were similar in appearance to those recorded by Blüthen and Reifenrath (2003) for *Ardisia pachyrrachis* (F.Muell.) F.M.Bailey, as extrafloral nectaries); stalked glandular papillae are present on the margins of the anthers and particularly towards the apex (**Fig. 1a**).

Taxonomy

Tapeinosperma Hook.f. in Benth. & Hook.f., *Gen. Pl.* 2:647 (1876). **Lectotype:** *Tapeinosperma vieillardii* Hook.f. (Sleumer 1988).

Derivation of name: From the Greek *tapeinos* - low or humble, and *sperma* - seed, referring to the small seed.

Shrubs or small trees, branches glabrous or occasionally a few uniseriate hairs present when young; leaf scars usually obvious, on older branches lenticels often prominent; terminal buds may bear flat capitate scales. Leaves simple, alternate, subopposite to opposite, often crowded towards the ends of branches thus appearing pseudowhorled; shortly petiolate; lamina in Australian species, chiefly oblanceolate to obovate; glabrous or with flat capitate scales scattered on the abaxial surface; adaxial surface often glossy green, abaxial surface paler, chartaceous to coriaceous; apex acuminate, base cuneate, margins entire, undulate, crenulate to irregularly serrulate; venation obvious, lateral veins often numerous and curving in from the margin; glands globular, irregularly rounded to lineate, pellucid, or red to dark red drying black, some small globular red glands may be present; for Australian species, the number of glands per areole lacking veinlets varies from 1–8, to 25 in areoles with veinlets. Inflorescence paniculate, (in non-Australian species the panicle is sometimes congested) terminal or arising from the axils of the uppermost leaves; branches usually reddish, subtended by chartaceous, usually caducous bracts; pedicel subtended by small caducous bracts; glands present. Flowers bisexual, 5-merous, variants occasionally recorded; glands irregularly rounded and/or lineate. Calyx deeply divided, cupuliform, in non-Australian species may be rotate or occasionally clavate, lobes thick, margins imbricate in bud, glands present, pellucid to dark red to black. Corolla urceolate, in some non-Australian species campanulate or tubular, lobes may be shorter than, equal to or longer than the tube, apex rounded, glands if present globose or shortly lineate, pellucid, dark red to black. Stamens: filaments fused at base, adnate to the corolla-tube at base, free and ligulate distally; anthers oblong-deltoid, apiculate, dorsifixed, longitudinally dehiscent, introrse, glandular papillae present; pollen tricolporate, exine reticulate. Ovary ovoid or occasionally obturbinate, flat capitate scales may be present; style slender elongating after anthesis; stigma small and discoid or punctiform. Ovules 2–12, borne in shallow grooves on the outside of the ovoid placenta or, as in Australian species embedded. Drupe globular to depressed globular, reddish, exocarp thin, fleshy when fresh, numerous glands present, endocarp

crustaceous smooth or angled, glands present; style usually persistent but often broken. Seed one, shape various, embryo transverse, thin, curved, cotyledons elongated slender, endosperm ruminate or not.

About 60 species are currently recognised in the genus, chiefly from the New Guinea region, Australia, New Caledonia and eastwards to Fiji. The genus has been confused with both *Discocalyx* and *Ardisia*. It may be readily separated from *Discocalyx* by the presence of bisexual flowers; stamens basally adnate to the corolla tube, but distally free and anthers are dorsifixed rather than anthers appearing almost sessile on the corolla tube; and the long slender style. In *Ardisia* the staminal filaments are free or basally connate into a minute tube adnate to the corolla or in most of the Australian species the anthers are sessile or almost so. The inflorescence in Australian species of *Tapeinosperma* is paniculate and not umbellate or congested as in *Ardisia* and the corolla is urceolate with the lobes erect or weakly spreading at maturity as against the corolla being campanulate or rotate with widely spreading lobes.

The genus consisting of three endemic Australian species extends from North Queensland (c. 15°S) along the eastern coastline to northern New South Wales (c. 28°S). A fourth species known only from the type collection, which has been placed in both *Embelia* and *Tapeinosperma* is now considered to be more closely related to *Embelia*, because of the presence of unisexual flowers, stamens free or scarcely adnate to the corolla and the general pubescence. Additional specimens are required before it can be definitely assigned to an existing genus.

Flowers in the Australian species appear to be protogynous. The style and stigma protrude from the urceolate corolla prior to anther dehiscence and prior to the corolla lobes becoming erect or even slightly spreading. No pollen was observed on the style and stigma at this stage.

Key to species of *Tapeinosperma*

1. Calyx and corolla with pellucid glands only. Leaf lamina with pellucid glands only, (4–)6–8 per areole lacking veinlets, to 25 in areoles with veinlets ..... **1. T. pallidum**
   Calyx and corolla with prominent orange to dark red to almost black glands. Leaf lamina with pellucid glands only, or pellucid and red to dark red glands, 1–6 per areole or up to 10 in areoles with veinlets 2

2. Corolla with orange and dark-coloured glands, the latter chiefly irregularly globose, randomly distributed. Leaf lamina with scattered small globular red to dark red glands, may be sparse; lineate pellucid glands with a length:width ratio up to 4:1 rarely more, 1–4 per areole ..... **2. T. pseudojambosa**
   Corolla with very dark-coloured glands, chiefly lineate, restricted to the median area. Leaf lamina lacking the small globular red glands; lineate pellucid glands with a length: width ratio of 2:1 or less, 2–6 per areole lacking veinlets, up to 10 in areoles with veinlets..... **3. T. repandulum**

---

1. Tapeinosperma pallidum Jackes **sp. nov.**

A *T. pseudojambosa* in lamina folii absentia glandium rubrarum, a *T. repandulo* in lamina folii praesentia glandium magnarum lineatarum pellucidarum ratione (longitudo:latitudo) quam 3:1 majore et aliquot usque 10:1 (in illo non majus quam 2:1) et ab ambobus absentia glandium rubrarum atratarumve in corolla distinguatur. **Typus:** Queensland. North Kennedy District: Keough's scrub, Portion 53V, Herberton, 17°30'S, 145°28'E, 20 November 1973, *B.P. Hyland 7111* (holo:

QRS34393; iso: QRS34394, BRI, CANB, NSW).

Tapeinosperma sp. (Cedar Bay J.G.Tracey 14780) in Henderson (2002).

Shrub or small tree 2–9 m tall, often much-branched; outer bark smooth, brownish, blaze pale pink with darker stripes, branchlets pale, rarely reddish, usually angular with ridges extending down from the base of the petiole, leaf scars obvious; scales occasionally present on terminal bud. Leaves alternate to pseudowhorled: petiole 0.5–3(–4) mm long; lamina oblanceolate, obovate, rarely tapering abruptly to the apex, 4–15.8(–18) cm long, 1.2–4.2(–5.6) cm wide, glabrous, scattered pale-coloured scales may be present on abaxial surface, adaxial surface glossy green, abaxial surface paler, chartaceous; apex acuminate, base cuneate, margins undulate, entire or irregularly serrulate to crenulate, midrib depressed on adaxial surface, prominently raised on abaxial surface, 18–25 pairs of lateral veins on either side of the midrib, looping near the margins. Glands, usually about 6–8 per areole lacking veinlets, up to *c.* 25 in an areole with veinlets; chiefly irregularly globular and shortly lineate with a length:width ratio of 3:1, but some lineate with a length:width ratio up to 10:1 also occur, particularly near the midrib, pellucid. Panicle 4–20 cm long, 4–8(–12) cm wide, branches reddish, 5–11 primary branches, the subtending bracts chartaceous, to 25 mm long, often prominent particularly towards the base, glands pellucid; panicle usually increases in size as fruit develop. Pedicels (2–)5–10 mm long, usually reddish, often curving and lengthening after anthesis, glands pellucid, bracts to 2 mm long, capitate scales occasionally present. Flowers 2.5–3(–4) mm long, glands pellucid. Calyx cupuliform, green, tube 0.25–0.5 mm long, lobes triangular 1–1.5 mm long, *c.* 0.75 mm wide at base, often spreading, glands pellucid. Corolla urceolate, white, creamy green to pink, tube 1.5–2(–3) mm long, lobes 0.5–1 mm long, *c.* 0.75 mm wide at base, lobes often slightly spreading, glands pellucid. Stamens: filaments ligulate, 0.5–1 mm long, some glandular hairs may be present; anthers 1.5–2 mm long, deltoid, apiculate, some pale-coloured glandular papillae towards apex. Ovary globular to obturbinate 0.7–1 mm long, capitate scales present; style 2–3 mm long, elongates after anthesis, stigma punctiform, glands pellucid. Ovules 4 or 5. Fruit globular to depressed-globular, sometimes ribbed, 5–8 mm long, 6–8 mm wide, red; style persistent. **Fig. 1, 2, 5A, 6A.**

***Selected specimens examined*: Queensland**. Cook District: S.F.R.185, Danbulla, 17° 06'S, 145° 36'E, Apr 1992, *Cooper & Cooper WWC238* (QRS); S.F.R. 143, Windmill Creek, 16° 34'S, 145° 15'E, Nov 1997, *Cooper & Cooper WWC1172* (QRS); Mt Demi, 2 miles [3.2 km] SW of Mossman, Nov 1944, *Flecker NQNC9017* (QRS); Herberton Range, tributary of Rocky Creek, 17° 14'S, 145° 25'E, Dec 1996, *Ford 1836* (BRI, NSW, QRS); N.P.R. 904, Wooroonooran, Coolamon Creek, c. 700 m S of Towalla Mine, site 34, 17° 28'S, 145° 44'E, Oct 2001, *Ford 3049, Holmes & Cooper* (BRI, NSW, QRS); Davies Creek L.A., S.F. 607, 14.2 km past Davies Creek Falls, 17° 04'S, 145° 36'E, Mar 1988, *Forster PIF3888* (BRI, DNA); Daintree N.P., Mt Sorrow track before razorback, 2.5 km W of Cape Tribulation, 16° 04'S, 145° 27'E, Dec 1997, *Forster PIF21975, Booth, Jago & Jensen* (BRI, K, MEL, NSW, QRS); S.F.R. 185, Danbulla, Breach L.A. 17° 05'S, 145° 38'E, Dec 1991, *Gray 5364* (QRS); F.R. 194, Atherton District, Mar 1962, *Hyland AFO/2787* (BRI); Mt Lewis road near the CSIRO plot, 16° 31'S, 145° 15'E, Nov 2001, *Jago 6060 & Worboys* (BRI); Johnstone River, 1915 *Michael 25* (BRI); Downfall Creek area near northern shore of Tinaroo Falls Dam, 17° 09'S, 145° 35'E, Sept 1972, *Moriarty 1139* (CANB, NSW, QRS); Cedar Bay, 15° 49'S, 145° 20'E, Oct 1972, *Tracey 14780* (BRI);. Mt Finnegan, S of Cooktown 15° 47'S, 145° 17'E, Aug 1972, *Webb & Tracey 10856* (BRI, K); Malanda, Jan 1918, *White s.n.* (BRI [AQ91814]). North Kennedy District: Bridge K10, Douglas Creek, Kirrama, 18° 13'S, 145° 53'E, Nov 1997, *Cooper & Cooper WWC1172* (QRS); Murray River, Rockingham Bay, Nov 1869, *Dallachy s.n.* (MEL1612793); Kirrama Range S.F. 344, *c.* 38 km NW Kennedy, 18° 01'S, 145° 36'E, Nov 1989, *Fell DGF2000* (BISH, BRI, CANB, MEL, QRS); Mt Fox, Dec 1954, *Volck AFO950* (QRS).

***Distribution and habitat*:** This species is usually found in the rainforests of northern Queensland particularly in complex mesophyll vineforest, although it does occur in drier situations on a variety of soil types. It extends from the Cooktown area *c.* 15° 30'S south to the Ingham area *c.* 18° 30'S (**Map 1**). Altitudinal range is from 300 to 1100 m.

***Phenology*:** Flowering occurs in spring and early summer, with a peak in November to December. Fruits have been collected from November through to September.

***Notes*:** This north Queensland species is easily distinguished when flowering as it is the only species where there are no red or dark-coloured glands present in the calyx and corolla. The often conspicuous bracts subtending inflorescence branches and the pedicels have pellucid glands

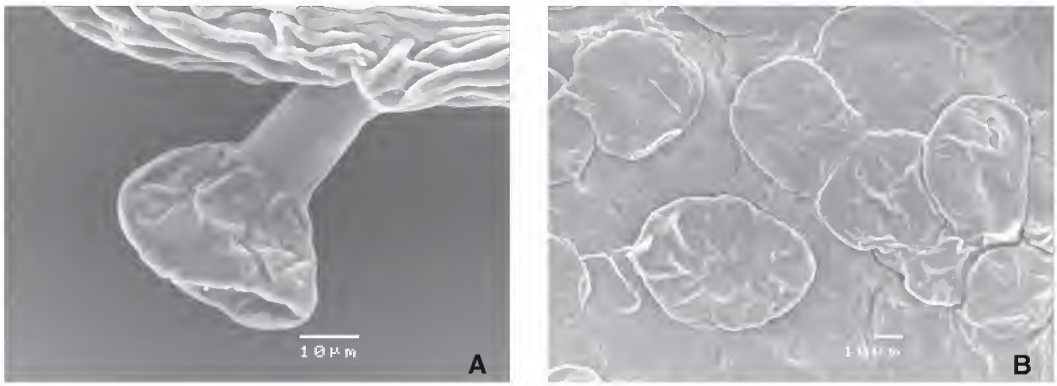


Fig. 1. ***Tapeinosperma pallidum.*** A. glandular papilla on anther. B. capitate scale on ovary. All from *Cooper & Cooper WWC1172* (QRS). Scale bar = 10μm

only, unlike *T. repandulum* where the bracts are much smaller and have dark lineate glands, the bracts in *T. pseudojambosa* are very early caducous. In vegetative specimens, the absence of red globular glands in the leaves separates it from *T. pseudojambosa*. The number of glands per areole, (4–)6–8 in areoles lacking veinlets and up to 25 where veinlets are present in the areoles, will usually readily separate this species from both *T. pseudojambosa* and *T. repandulum* where there are fewer glands per areole, the latter species only occurs in southern Queensland and northern New South Wales. However, the latter is readily separated on the length:width ratio of the lineate pellucid glands which rarely exceed 2:1 compared to *T. pallidum* where many exceed 3:1 and usually some much longer ones occur with a ratio of up to 10:1.

Although usually an erect, much branched shrub or small tree, there are a number of records of the main stem lying horizontally with branches arising vertically.

***Etymology*:** From the Latin *pallidus* – pale, referring to the pale-coloured flowers where only pellucid glands are present in the calyx and corolla.

2. Tapeinosperma pseudojambosa (F.Muell.) Mez in Engler, *Pflanzenr.* 1(IV: 236): 170 (1902).

Ardisia pseudojambosa F.Muell., *Fragm.* 4:81 (1864). **Type:** Queensland. North Kennedy District: Mt Elliot, *Fitzalan* (lecto [here chosen]: MEL1612779; isolecto: MEL1612768).

Shrubs or small trees 1–12 m tall, trunk slender, bark smooth, nondescript to mottled greyish-brown, lenticellate, blaze cream to pinkish-red; branchlets reddish with small ridges extending down from base of the petiole. Leaves alternate to subopposite, petiole reddish, 1–6 mm long, often thickened, small flange may be present. Lamina broadly obovate, usually abruptly tapering to acuminate apex, 7–17.3 cm long, 2.2–6.5 cm wide, glabrous or with rufous-coloured, capitate scales on abaxial surface, chartaceous; margins undulate, entire or crenulate, midrib depressed on adaxial surface, prominently raised on the abaxial surface; >23 lateral veins on either side of the midrib; glands 1–4 per areole rarely more; globular to shortly lineate pellucid with a length:width ratio up to 4:1, rarely pellucid glands absent, scattered small globular red glands present, distribution and density variable. Panicle 3–10 cm long, 3–11 cm wide, enlarging as fruit develops, 4–10 primary branches, reddish, the subtending bracts very soon caducous, rarely present at maturity; pedicels 4–7 mm long at anthesis, often curving so flowers appear pendulous, glands obvious dark red, bracts caduous *c.* 1mm long. Flowers 3–4 mm long, 5-merous, occasional 6-merous, dark-coloured glands prominent on calyx, corolla and style, pellucid glands sometimes present. Calyx cupuliform, tube 0.25–0.5 mm long, lobes triangular 1–1.5 mm long, *c.*1 mm wide at base, glands prominent, orange to dark red. Corolla urceolate, creamy-green, white, cream to pale pink, tube 1.5–3 mm long, lobes triangular 0.5–1.5 mm long, *c.* 1mm wide at base; orange to dark red glands prominent on lobes, appearing verrucose, some pellucid glands may

Fig. 2. ***Tapeinosperma pallidum***. Scan of *Cooper & Cooper WWC1172* (QRS).

be present on tube. Stamens: filaments thick, ligulate, 0.5–1 mm long; anthers 2–2.5 mm long, deltoid, apiculate, glandular rufous-coloured papillae present. Ovary conical to depressed-globular, 1–1.5 mm wide, *c.*1 mm high, scattered rufous-coloured capitate scales present, style 2–3(–5) mm long elongating after anthesis, glands red, stigma punctiform. Ovules 6 or 7. Fruit depressed-globular 6–7 mm long, 7–8 mm diam., dark pink to red, glands black when dry, style persistent. **Fig. 3, 5B, 6B.**

***Selected specimens examined*: Queensland**. North Kennedy District: Dugong Inlet, Whitsunday Is, 20° 05'S, 148° 57'E, Sept 1990, *Batianoff 900991A* (BISH, BRI, LAE); near South Pinnacle, 25 km SW of Townsville, 19° 24'S, 146° 38'E, Sept 1992, *Bean 5053* (BRI); Bluewater Range, WNW of Townsville, 19° 13'S, 146° 24'E, Nov 1996, *Cumming 15306* (BRI); S.F.R. 344, Kirrama road c. 1 km NNW of Mt Collins, site 62, 18° 10'S, 42° 18'E, Jun 2002, *Ford 3494 & Holmes* (BRI, QRS); Mt Dryander S.F. Dryander Creek, left branch, 20° 16'S, 148° 34'E, Oct 1999, *Forster PIF25000 & Booth* (BRI, DNA, K, L, MEL, QRS); Strathdickie, near Proserpine, 20° 25'S, 148° 35'E, *Michael 1116* (BRI); Dryander Creek, c. 2 km N of Gregory and c. 20 km N of Proserpine, 20° 24'S, 148° 35'E, Nov 1985, *Sharpe 4173* (BRI, CANB, K). South Kennedy District: T.R. 179, Kalvin, 6 km W of Koumala, 21° 36'S, 149° 11'E, Apr 1991, *Forster PIF8033 & McDonald* (BRI, K, MEL, QRS); Mt Beatrice N.P. northern tributary of Catherine Creek, 21° 52'S, 148° 40'E, Jul 1993, *Forster PIF13393 & Tucker* (BRI, QRS); Eungella N.P. Broken River Circuit Track, 20° 55'S, 148° 35'E, Mar 1990, *Pearson 213* (BRI); Massey Creek, Eungella Range, Oct 1951, *Smith 4780* (BRI); Cathu S.F. 20° 50'S, 148° 35'E, Nov 1981, *Young 438* (BRI). Leichhardt District: On ranges south west from Sarina, May 1927, *Francis s.n.* (BRI [AQ91823]). Port Curtis District: Fitzroy River, Jun 1865, *Bowman s.n.* (MEL1612762); Rockhampton, Jan 1862, *Dallachy 111* (MEL); Rockhampton, Oct 1865, *Dietrich 1501* (MEL); Colosseum Creek, T.R. 115, Many Peaks Range, 24° 23'S, 151° 27'E, Jan 1994, *Forster PIF14635* (BRI, MEL, QRS); Granite Creek, Bulburin S.F. 24° 33'S, 151° 31'E, Dec 1982, *Guymer 1819 & Dillewaard* (BRI, CANB); Shoalwater Bay Training Area, site SW07, Polygon range, E of Mt Mulgrave, 20° 37'S, 150° 17'E, Sep 1994, *McDonald 5748 & Tweedie* (BRI); Rockhampton, *Thozet 14* (MEL); Jeffrey's property "Shirley", Agnes Waters road, turn left at Bindaree then left at Jeffrey's road, 24° 18'S, 151° 36'E, Oct 1998, *Worthington 1937* (BRI).

***Distribution and habitat*:** This species is found chiefly in rainforest on drier sites or along creeks growing on a variety of substrates. It is frequently found as an understorey shrub growing in association with *Argyrodendron* spp. as canopy emergents and species of *Gossia*. It extends from west of Cardwell on the drier side of the Cardwell Range (c. 18°S) south to Bulburin State Forest area (24° 33'S) (**Map 2**). Altitudinal range is from 70-600 m.

***Phenology*:** Flowers from August to February with a peak from September to early November. Fruits have been collected from November to May. The period from fertilisation to maturation is approximately two months, but fruit may remain attached for longer periods.

***Notes*:** This species is easily distinguished from the other two species by the presence of small globular red to dark red glands scattered throughout the leaf lamina, often at least one per areole; however, in some specimens they are sparse and in thick leaves they may be difficult to find. Most areoles are simple and lack veinlets, and there are 1–4(–6) glands per areole. The number of glands per areole combined with the small globular red glands can be used to identify sterile specimens of this species. The obovate leaves abruptly tapering to the apex are more common in this species than in the others. It is the only species where the orange to dark-coloured glands are randomly distributed throughout the petals.

***Etymology*:** From the Latin *pseudo* - false, and the genus *Jambosa* Adans., a synonym of *Syzygium* indicating that it is similar in appearance to certain species of *Syzygium*.

3. Tapeinosperma repandulum (F.Muell.) Jackes **comb. nov.**; *Ardisia repandula* F.Muell. *Fragm.* 4: 82 (1864). **Type:** New South Wales. North Coast District: Richmond River, *C. Moore.* (lecto [here chosen]: MEL654527).

Tapeinosperma sp. (Woombye A.R. Bean 994) in Henderson (2002).

Shrubs or small trees 1.5–5 m tall, crown often sparse and open; branchlets angular, may be winged, reddish, leaf scars present, terminal buds with small capitate scales. Leaves alternate, subopposite to opposite, often in pseudowhorls; petiole reddish, 2–4 mm long, margins often with a small wing that continues down the stem; lamina lanceolate to oblanceolate rarely obovate, tapering to the apex 7.8–19.3 cm long, 2.3–5.6 cm wide, glabrous or pale capitate scales sparse, adaxial surface

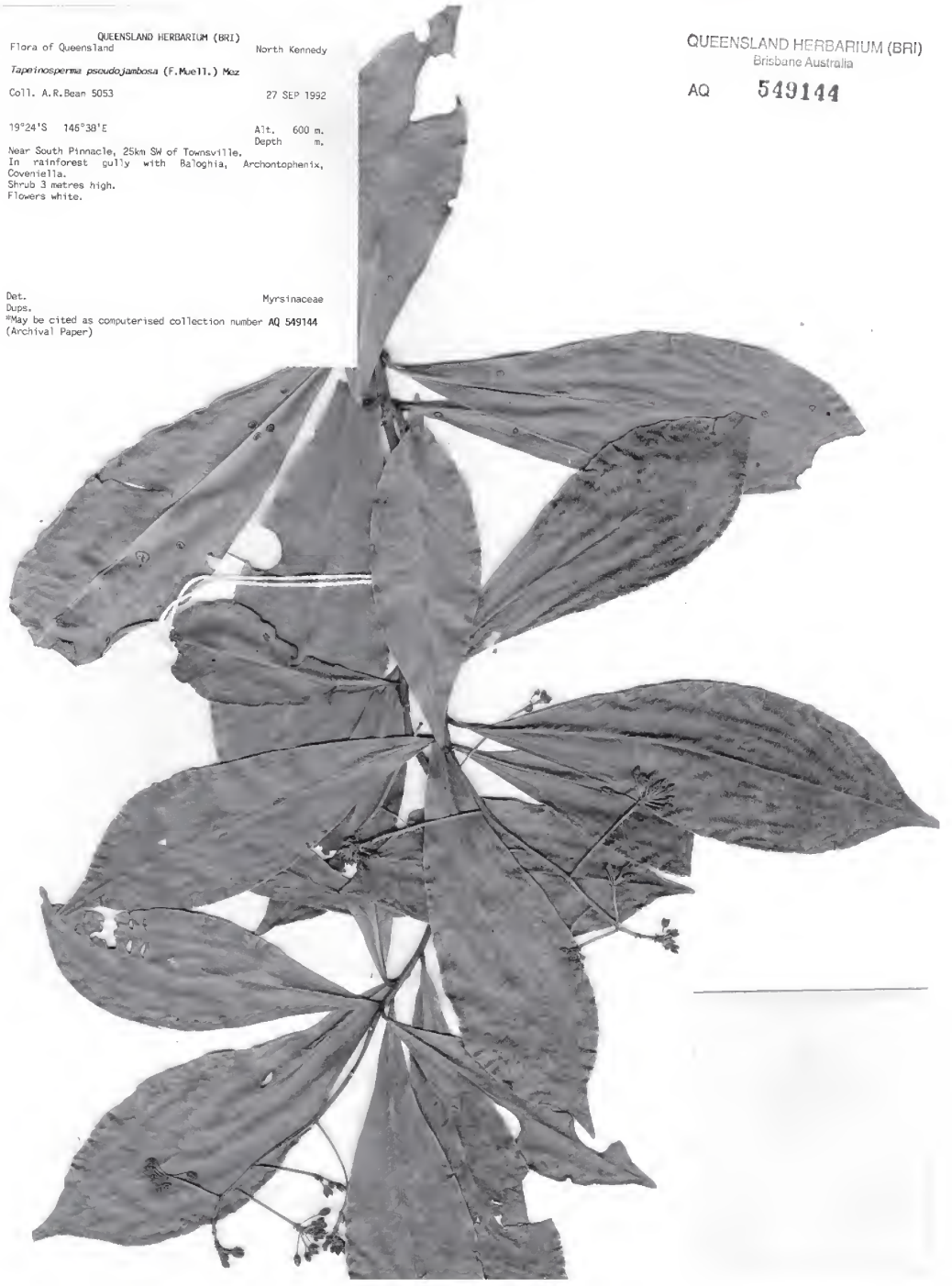


Fig. 3. ***Tapeinosperma pseudojambosa***. Scan of *Bean 5053* (BRI).

glossy, abaxial surface paler, chartaceous; apex acuminate, base cuneate, margins undulate, irregularly serrulate to crenulate; midrib depressed on adaxial surface, prominent on abaxial surface, 15–25 lateral veins on either side of the midrib, looping towards the margin. Glands *c.* 2–6 per areole in areoles lacking veinlets, up to 10 in an areole with veinlets; globular to shortly lineate, length:width ratio ≤ 2:1, pellucid. Panicle, 2–8 cm long, 2–3 cm wide, 3–5 primary branches, the subtending bracts small, caducous. Pedicels 3–9 mm long, with dark-coloured lineate glands, elongating and curving as fruit matures; subtending bracts chartaceous *c.* 1 mm long with dark-coloured lineate glands. Flowers *c.* 3 mm long. Calyx cupuliform, tube *c.* 0.75 mm long, lobes triangular *c.* 0.75 mm long, 0.5 mm wide at base, dark-coloured glands present. Corolla urceolate, cream margins with dark to black centre, tube 1.5 mm long, lobes *c.* 1.5 mm long, glands pellucid towards the margins with dark-coloured chiefly lineate glands concentrated into the median area of the lobes, drying black. Stamens: filaments ligulate, 1 mm long, anthers 2 mm long deltoid, apiculate, dark-coloured glands usually present in apex, glandular papillae pale. Ovary globose, *c.* 1 mm diam., pale capitate scales present, style at anthesis 2.5–3 mm long elongating as fruit develops, dark glands present, stigma punctiform. Ovules 4 or 5. Fruit depressed-globular, 6–7 mm long, 8 mm diam., dark pink to red. **Fig. 4, 5C, 6C.**

***Additional specimens examined*: Queensland.** Wide Bay District: Kin Kin, Mar 1916, *Francis & White s.n.* (BRI [AQ91810], NSW26760); Kin Kin, Dec 1919, *Francis s.n.* (BRI [AQ91812]); Between compartments 1 and 2, Mothar L.A., S.F. 393 Woodum, c. 15 km SE of Gympie, 16° 15'S, 152° 49'E, Jan 1989, *McDonald 4262* (BISH, BRI, MO, NSW); East Cedar Creek c. 7 km N of Mapleton, 26° 33'S, 152° 52'E, Jan 1990, *Sharpe 4934 & Thomas* (BRI); Near Gympie-Imbil, 26° 20'S, 152° 40'E, Oct 1982, *Williams s.n.* (NSW259576, UNE). Moreton District: Brolga Park, beside Dulong road, W of Woombye, 26° 39'S, 152° 54'E, Jan 1989, *Bean 994* (BRI); Brolga Park, 6 km W of Woombye, 26° 39'S, 152° 54'S, Dec 1989, *Forster PIF6148, Bean & Tucker* (BRI); *c.* 0.6 km SE of Mt Wagawn, 28° 15'S, 153° 13'E, Feb 1986, *Guymer 2109* (BRI); Landsborough, *Shirley s.n.* (BRI [AQ91822]); Yandina, Mar 1891, *Simmonds s.n.* (BRI [AQ912821]); Eudlo, Nov 1891, *Simmonds s.n.* (BRI [AQ91582]); Mooloolah Scrubs, Dec 1890, *Unknown* (BRI [AQ91818]); Maroochie, Mar 1891, *Unknown* (BRI [AQ91829]); Eumundi, May 1892, *Unknown* (BRI [AQ91813]); Eudlo Scrubs, Nov 1896, *Unknown* (BRI[AQ91825]). **New South Wales.** North Coast District: Couchy Creek, below Sphinx Lookout, Springbrook, May 1977, *Floyd 351* (BRI, CANB, NSW); Richmond River, *Hodge s.n.* (MEL1612772); Oxley River, *c.* 12 km NW of Tyalgum, 28° 15'S, 153° 10'E, Jun 1986, *Williams & Bird 86005* (BRI).

***Distribution and habitat*:** This species is found along streams and in subtropical rainforest areas, often in very moist habitats within these forests. It has been collected from the Gympie area (c. 26°S) south to the northern rivers area of New South Wales (c. 28°S) (**Map 1**). Substrate varies from rhyolite to volcanic derived soils and it has been found at altitudes ranging from 80 to 700 m.

***Phenology*:** Flowers have been collected in summer and early autumn, while fruits have been collected throughout the year but chiefly from May to July.

***Notes*:** *Tapeinosperma repandulum* is a typical understorey species readily distinguished from the other species by the distribution of the dark-coloured glands in the corolla that are concentrated in the centre of the corolla lobes, with pellucid glands towards the margins. Vegetatively it is the only species with lineate pellucid glands rarely exceeding a length:width ratio equal to or less than 2:1.

***Etymology*:** From the Latin *repandus* - margin is wavy or somewhat uneven, referring to the margin of the leaf lamina.

Excluded species

Tapeinosperma flückigeri (F.Muell.) Mez in Engler, *Pflanzenr.* 1(IV:326):171 (1902) = **Embelia flückigeri** F.Muell. *Vict. Nat.* 8:200 (1892).

Type: Queensland. Cook District: Russell River, *S. Johnson s.n.* (holo: MEL1612758; iso: K).

Known only from the type collection and presumed extinct. All existing specimens seen were of poor quality. Additional material is required to confirm placement.

Acknowledgements

I am grateful to the Directors of the following herbaria - BRI, CANB, K, L, MEL, MO, NSW and QRS for the loan of specimens or permission to examine specimens and use their facilities. My thanks to Peter Bostock for the

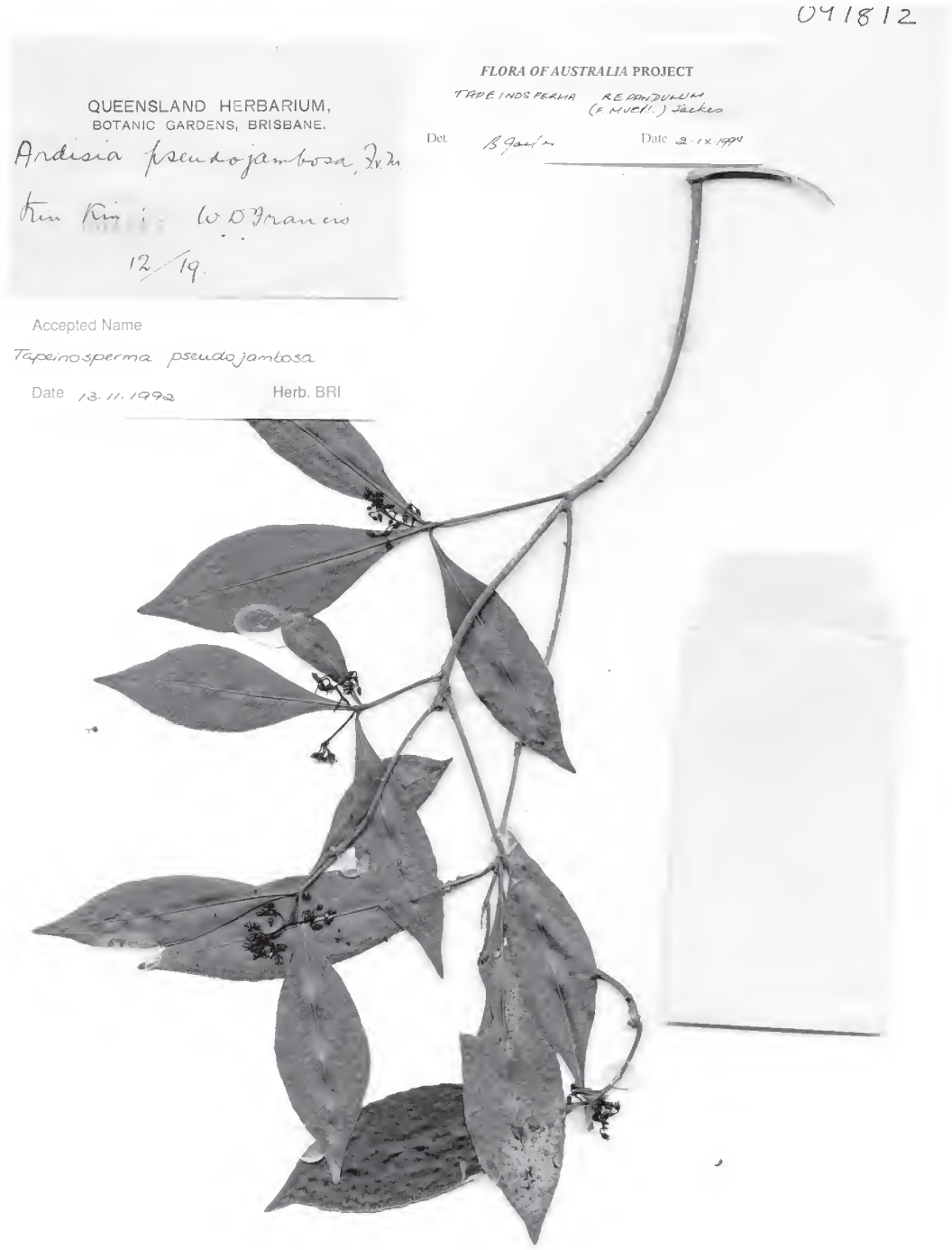


Fig. 4. ***Tapeinosperma repandulum***. Scan of *Francis* [AQ91812] (BRI).

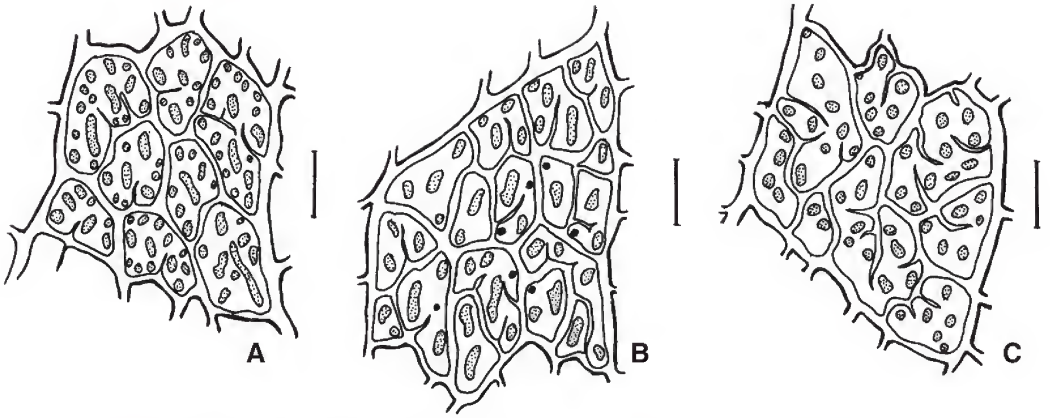


Fig 5. A. portion of leaves (mid section) showing the pattern of distribution of glands within the areoles, stippled glands are pellucid or orange coloured, solid glands are small globular red to dark red glands. A. ***Tapeinosperma pallidum*** (from *Dallachy s.n.* (MEL612793); B. ***T. pseudojambosa*** (from *Clemens s.n.* (BRI [AQ 91827]); C. ***T. repandulum*** (from *Moore 212* (MEL)). Scale bar = 1 mm.

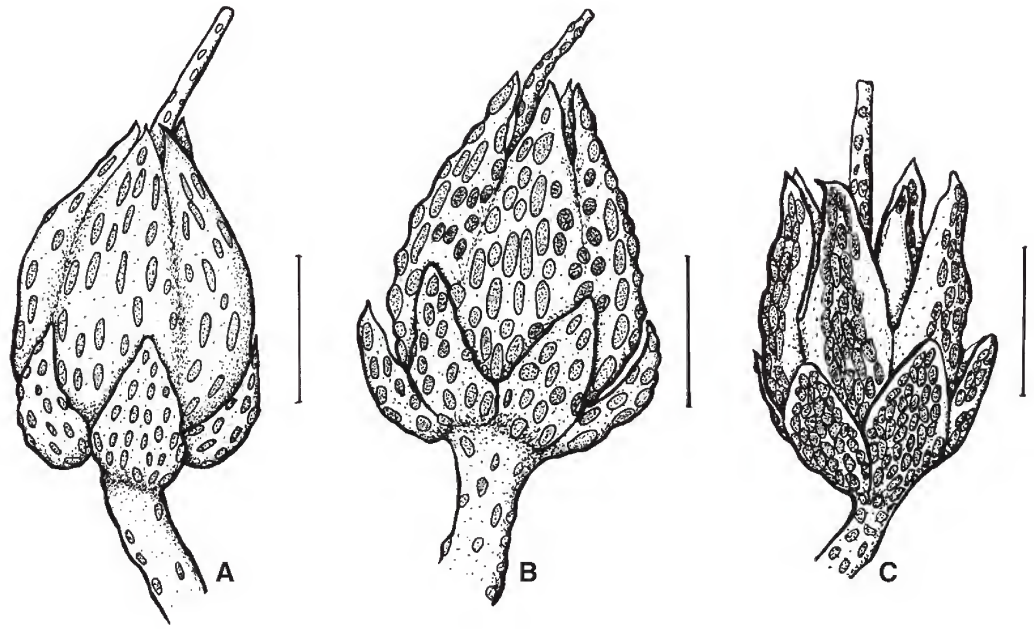


Fig. 6. ***Tapeinosperma pallidum.*** A. flower. ***T. pseudojambosa*** B. flower. ***T. repandulum*** C. flower. Lightly stippled glands are pellucid. Scale bar = 1mm. A from *Cooper and Cooper 1172* (QRS); B from *McDonald 5748 & Tweedie* (BRI); C from *Francis s.n.* (BRI [AQ 91812]).

Latin diagnosis and to Adella Edwards for preparing the maps and scanning specimens.

References

ANDERBERG, A.A., STAHL, B. & KALLERSJO, M. (2000). *Maesaceae*, a new primuloid family in the order *Ericales s.l. Taxon* 49: 183–187.

BLÜTHEN, N., & REIFENRATH, K. (2003). Extrafloral nectaries in an Australian rainforest: structure and distribution. *Australian Journal of Botany* 51: 515–527.

HENDERSON, R.F.J. (ed.) (2002). *Names and Distribution of Queensland Plants, Algae and Lichens*, p. 119. Environmental Protection Agency: Brisbane.

HICKEY, L.J. (1973). Classification of the architecture of dicotyledonous leaves. *American Journal of Botany* 60: 17–33.

JACKES, B.R. (2005). Revision of *Myrsine* (Myrsinaceae) in Australia. *Australian Systematic Botany* 18: 399–438.

MEZ, C.C. (1902). Myrsinaceae. In A. Engler (ed.) *Das Pflanzenreich* 9(IV.236): 1–437. Cramer: Weinheim/Bergstrafe.

OTEGUI, M.S., GASPAR, M.L., MALDONADO, S., VARETTI, E.L. & POLLERO, R. (1998). Studies on tissues associated with hydroxybenzoquinone secretion in *Myrsine laetevirens* (Myrsinaceae). *Nordic Journal of Botany* 19: 71–85.

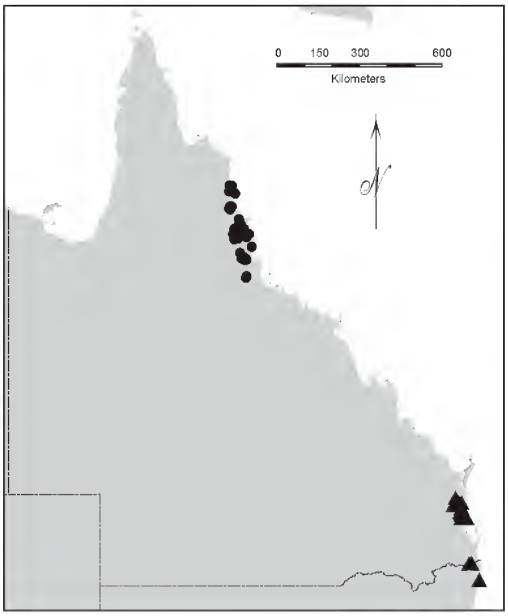
PIPOLY, J.J., & TAKEUCHI, W. (2004). New species of *Tapeinosperma* and *Discocalyx* (Myrsinaceae) from Morobe Province, Papua New Guinea. *Harvard Papers in Botany* 8: 153–159.

REYNOLDS, S.T. (1991). The genus *Embelia* N.Burman (Myrsinaceae) in Australia. *Austrobaileya* 3: 361–367.

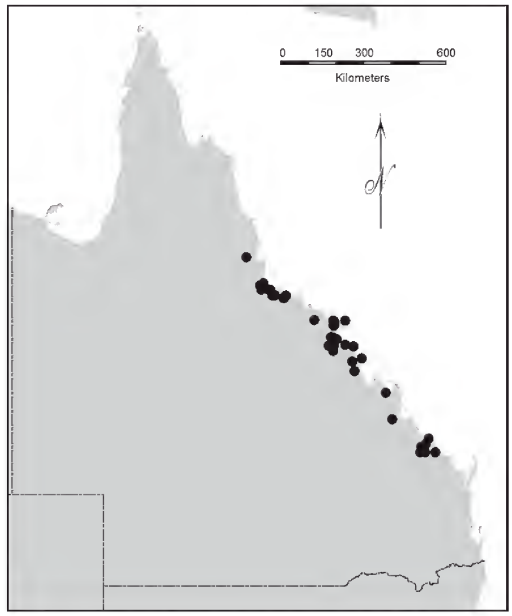
SLEUMER, H. (1988). The genera *Discocalyx* Mez, *Fittingia* Mez, *Loheria* Merr., and *Tapeinosperma* Hook.f. (Myrsinaceae) in New Guinea. *Blumea* 33: 81–107.

SMITH, A.C. (1973). Studies of Pacific Island Plants, XXV. The Myrsinaceae of the Fijian region; *Tapeinosperma*. *Journal of the Arnold Arboretum*. 54: 228–263.

STONE, B.C. (1989). New and noteworthy Malesian Myrsinaceae, III. On the genus *Ardisia* Sw. in Borneo. *Proceedings of the Academy of Natural Sciences of Philadelphia*. 141: 263–306.



Map 1. Distribution of *Tapeinosperma pallidum* ● and *T. repandulum* ▲.



Map 2. Distribution of *Tapeinosperma pseudojambosa* ●.

Notes on the narrow-leaved Ironbarks (Myrtaceae: *Eucalyptus* subseries *Subglaucae*)

A.R. Bean

Summary

Bean, A.R. (2005). Notes on the narrow-leaved ironbarks (Myrtaceae: *Eucalyptus* subseries *Subglaucae*). *Austrobaileya* 7(1): 111–120. The taxonomic history of the narrow-leaved ironbarks is discussed, as are the problems associated with the taxonomic delimitation of its member species, particularly *E. crebra sens. lat.* and *E. drepanophylla sens. lat.* *Eucalyptus elegans* sp. nov. is described and illustrated. The identity of the poorly known *E. bowmanii* Benth. is discussed, and the circumscription of *E. tholiformis* is expanded.

Key Words: Myrtaceae, ironbarks, eucalypt taxonomy, *Eucalyptus crebra, Eucalyptus drepanophylla, Eucalyptus elegans, Eucalyptus tholiformis,* Queensland flora, New South Wales flora

A.R. Bean, Queensland Herbarium, Environmental Protection Agency, Brisbane Botanic Gardens, Mt Coot-tha Road, Toowong, Queensland 4066, Australia

Introduction

Ironbark is the common name given to a group of *Eucalyptus* species with very hard, thick, fissured grey to black bark. This common name was first applied by the early colonists of New South Wales and Queensland and it must have been in common parlance by the 1840's, as the term was frequently used by Leichhardt (1847) to describe eucalypt trees he saw with these features.

Ironbark is perhaps the most distinctive of all bark types in *Eucalyptus sens. lat.,* and more than any other bark type, it reflects taxonomic affinity. In other words, all ironbark species are related to each other, whereas species with 'gum', 'box' or 'stringy' bark may belong to more than one taxonomic section or even subgenus.

Pryor & Johnson (1971) placed most ironbarks into two informal series, viz. *E.* series '*Pruinosae*' and *E.* series '*Paniculatae*'. Another series, *E.* series '*Melliodorae*', contained the two unusual ironbarks *E. sideroxylon* and *E. tricarpa*.

Brooker (1985) showed that the informal name '*Pruinosae*' is inappropriate, as *E. pruinosa* Schauer is box-barked, whereas all other species in the series are ironbarks. He proposed the series be renamed as informal *E.* series '*Crebrae*'. More recently, the informal classification of Pryor & Johnson (1971) has been replaced by formal names (i.e. using the rules of the ICBN) and the ironbark series under discussion became *E.* series *Siderophloiae* Blakely. The eucalypt volume of the Flora of Australia (Chippendale 1988) listed 12 species belonging to *E.* series *Siderophloiae*. Since then, 12 additional ironbark species belonging to that series have been described by Brooker & Bean (1987), Johnson & Hill (1990), Hill & Johnson (1991), Bean & Brooker (1994), Hill (1997a) and Hill (1997b).

Brooker (2000) nominated four areas of "poor resolution" within *Eucalyptus*, meaning species groups poorly understood taxonomically. The *E.* ser. *Siderophloiae* ironbark group was one of these. Brooker (*loc. cit.*) maintained that *E.* ser. *Siderophloiae* could be divided into two subseries; *E.* subser. *Subglaucae* (the subject of this paper) and *E.* subser. *Jugatae* Blakely. The latter is a small but complex group of taxa characterised by sessile opposite leaves retained in the crown of mature trees. Brooker listed 20 species for the *E.* subser. *Subglaucae,* excluding *E. drepanophylla* (as it was listed as a synonym of *E. crebra* in Brooker & Kleinig (1994)) and *E. farinosa* (perhaps merely by omission).

Accepted for publication 30 June 2005

Problems of recognising taxa

By the end of the 20th century, nearly all of the distinct ironbark taxa had been formally described, leaving the morass of *Eucalyptus crebra* and *E. drepanophylla*, both very widespread and very variable in their circumscription.

It was intended (by A.R. Bean & M.W. McDonald) to elucidate the taxonomy of these species using a combination of herbarium studies, field studies throughout their range, seedling trials and allozyme analysis. Initial herbarium sorting of taxa was hampered by the incomplete nature of most specimens which lacked either mature buds or fruits or both. Very few specimens included juvenile leaves. This made it difficult to compare and classify specimens.

Field studies did reveal a number of seemingly distinct taxa from various parts of Queensland and New South Wales, by allowing access to a more complete range of fertile material and juvenile leaf morphology. On that basis, tentative taxa were erected and given phrase names e.g. *Eucalyptus* sp. (Stannary Hills G.W. Althofer 402), and specimens in the Queensland Herbarium were thus annotated. However, curation of the herbarium material remained very difficult, as there were often no characters that could consistently separate taxa.

Bean and McDonald collected seed of nearly all of the tentative taxa identified from the field studies for later allozyme analysis. For each provenance, the seed collection was derived from five parent trees in close proximity. For the tentative taxa perceived to be widespread, up to four provenances were collected, and for *E. crebra* and *E. drepanophylla*, seed collections from their type localities were included. The allozyme study was undertaken (see Achour 2003) and the results showed that "*Siderophoiae* taxa were characterised by high levels of allozyme variation and relatively similar allelic frequencies. This is reflected in the lack of bootstrap support for the clustering of most taxa ...".

Seedling morphology has proved to be taxonomically very useful in many groups of eucalypts. Hence a comprehensive ironbark seedling trial was undertaken by the present author. Seedlings of all of the tentative taxa, as well as most of the already described species of the subseries were raised to a height of 30-40 cm, and scored for a variety of characters. While the seedling characteristics of the established species (sometimes quite diagnostic) were confirmed, there was little differentiation between the tentative taxa, and the variation within taxa was considerable. None of the tentative taxa (except *E. elegans*, see below) could be distinguished on the basis of seedling morphology.

Further field examinations, away from "core areas" of the tentative taxa showed that most intergraded extensively with the geographically adjacent taxon, to such an extent that additional taxa are impossible to define and diagnose.

A similarly difficult taxonomic situation exists in the Red Gum group (*Eucalyptus* subser. *Erythroxyla* Blakely). Brooker & Slee (2000) documented intergrades between several pair combinations of long established species, and they highlighted the difficulties of identifying and classifying these intergrading forms.

Holman (2002) has studied the apparent intergradation between the two ironbark species, *Eucalyptus whitei* (of *E.* subser. *Subglaucae*) and *E. melanophloia* (of *E.* subser. *Jugatae*). He has shown that there is almost no genetic difference between them. These taxa intergrade over a vast area of central Queensland, forming a cline that "represents a single cohesion species and a single evolutionary lineage". This research refutes having these two species in different subseries.

Because the end points of the *whitei-melanophloia* cline are so morphologically dissimilar, the intergrades are very obvious. In the case of the tentative taxa considered in this paper, there are probably similar patterns of clinal variation, but as the endpoints of the clines are morphologically quite similar, the intergrades are more cryptic.

A combination of these factors has forced me to abandon nearly all of these tentative new taxa, and revert to a broadly circumscribed *E. crebra* and *E. drepanophylla*. While most of the intergrading forms are referable to these two species, there are several other species involved. Intergrades have been observed

between the following species pairs e.g. *E. drepanophylla* and *E. xanthoclada, E. whitei* and *E. crebra, E. quadricostata* and *E. xanthoclada, E. cullenii* and *E. crebra, E. drepanophylla* and *E. granitica, E. atrata* and *E. crebra*.

Practicality and utility requires that the existing species continue to be recognised, but we need to be aware that some populations cannot be identified with certainty.

One new species (*E. elegans*) is described here. Uniquely, it often grows in a mosaic pattern with *E. crebra* without any intergradation or hybridisation, and is considered sufficiently distinct by virtue of its exceptionally small buds and fruits, linear juvenile leaves, and linear to narrowly lanceolate adult leaves. The poorly known *E. bowmanii* Benth. is discussed, and its identity is reaffirmed. The circumscription of *E. tholiformis* has been expanded.

A key to the taxa comprising *E.* subseries *Subglaucae* is presented. Of necessity, it uses some characters observable only in the field. It must be pointed out that for the narrow-leaved ironbarks, imperfect herbarium specimens often cannot be identified.

Taxonomy

Eucalyptus subser. *Subglaucae* Blakely, *Key Eucalypts* 59, 250 (1934). **Type:** *E. siderophloia* Benth.

Lignotuberous trees, rarely reduced to mallee form. Bark on trunk rough, grey to black, longitudinally furrowed, usually very hard and unyielding, impregnated with kino, comprising many very small to quite large lamellae; commonly referred to as 'ironbark'. Rough bark persistent on trunk and at least on the major branches, and often persistent throughout. All parts glabrous. Cotyledons reniform. Seedling and juvenile stems more or less terete; seedling leaves petiolate, opposite for 4–9 pairs; juvenile leaves petiolate to subsessile, alternate. Adult stems more or less terete, pith glands absent; adult leaves glabrous, petiolate, alternate, concolorous, margins entire; lateral veins at 45–60 degrees to midrib; venation very densely reticulate; intramarginal vein close to margin or sometimes confluent with it; oil glands numerous to occasional, circular, island or intersectional, sometimes absent; petioles terete. Conflorescences compound, pseudo-terminal and in upper leaf axils, unit inflorescences umbellate, 3–7-flowered, peduncles erect, pedicels present. Buds smooth. Outer operculum shed early in bud development. Stamens annular, in several whorls, white, all fertile, irregularly flexed, anthers adnate, basifixed, globoid, opening by lateral non-confluent slits. Stigma blunt. Ovary 3–5 locular. Ovules in four longitudinal rows on placenta. Fruits woody, with narrow staminophore, disc descending or rarely ascending, valve tips not connate; peduncles erect, pedicels present. Seeds ellipsoidal, somewhat flattened, grey-black, shallowly reticulate, not winged, hilum ventral. Fertile seeds much larger and darker than chaff.

Eucalyptus elegans A.R.Bean **sp. nov.** affinis *E. crebra* autem foliis juvenibus linearibus 2.5–6 mm latis, foliis adultis pro parte maxima linearibus, alabastris maturis 3–4 mm longis, fructibus 2.6–3.9 mm longis differt. **Typus:** Queensland. Darling Downs District: north end of Bendidee National Park, NE of Goondiwindi, 27 November 1999, *A.R. Bean 15864* (holo: BRI; iso: CANB, NSW).

E. sp. (Chinchilla L. Pedley 4022) in Henderson (2002)

E. sp. (Inglewood P. Grimshaw+ PG846) in Henderson (2002)

E. sp. (Gilgandra D.J. Carr+ 352) in Henderson (2002)

Tree 8–28 m high, rough bark persistent throughout. Seedling leaves opposite for 3–4 pairs, narrowly lanceolate, 55–61 × 8–11 mm, discolourous, not glaucous, apex acute or obtuse, margins entire, petioles 3–4 mm long. Juvenile leaves linear, 45–83 × 2.5–6 mm, 12–22 times longer than wide, discolorous, apex acute, base cuneate; petioles 2–4.5 mm long. Adult leaves with petioles 9–14 mm long; lamina narrowly lanceolate to linear, or falcate, 75–165 × 7–11 mm, 7–20 times longer than wide, apex acute to attenuate, base cuneate, green to bluish-grey, dull. Vein network dense, oil glands appearing as isolated islands within the areoles.

Intramarginal vein present, single, close to margin. Inflorescences largely terminal, compound, the lower umbels axillary. Unit umbels 3–7-flowered; peduncles terete, 2.5–7 mm long, 0.6–0.8 mm wide; pedicels 2–3.5 mm long; buds obovoid to ellipsoid, at maturity 3–4 mm long, 2.2–2.8 mm wide; hypanthium wrinkled when dry, but not ribbed. Operculum conical to hemispherical-umbonate, 1.1–2 mm long, 1.8–2 mm wide, not ribbed, shorter than hypanthium. Stamens white, outer whorls *c.* 2.5 mm long and inner whorls *c.* 1.3 mm long. Style 1–1.5 mm long at anthesis, stigma blunt or dilated. Fruiting peduncles 1.5–6 mm long, 0.7–0.9 mm wide; pedicels 1–3 mm long; fruits cupular, circular in cross-section, not or very faintly ribbed, 2.5–4 mm long, 2.7–4 mm wide, staminophore 0.2–0.3 mm wide, disc obliquely to vertically descending; valves 3–4, valve tips exserted or at rim level. Seeds grey to black, *c.* 0.8 mm long, flattened, surface +/- reticulate. **Fig. 1.**

***Selected specimens examined*: Queensland.** Burnett District: 2 km SW of 'Rockybar', Mar 1990, *Bean 1433* (BRI); 30 miles [50 km] SW of Mundubbera, Sep 1969, *Pedley 2892* (BRI). Darling Downs District: Bracker State Forest, S of Inglewood, Dec 1990, *Bean 2736* (BRI, CANB); S of Jackson, Sep 1948, *Blake 18224* (BRI); Barakula S.F., Apr 1975, *Brooker B4782* (BRI, CANB); 1.5 km E on road 4.9 km N of Barakula Forest Office, Sep 1974, *Chippendale GC1079 & Brennan* (BRI, CANB); Winfield Road, Weiambilla, N of Tara, Sep 1998, *Foley s.n.* (BRI); Bracker S.F. 81, 2 km N of Brush Creek, 20.9 km S of Inglewood, Jul 1994, *Grimshaw PG846 & Taylor* (BRI); 5.8 km N of Miles, Jan 2000, *McDonald KRM245* (BRI); 23 miles [38.3 km] N of Chinchilla, Nov 1968, *Pedley 2782* (BRI); near Cecil Plains, Dec 1969, *Pedley 3073* (BRI); 15 km WNW of Chinchilla, Dec 1972, *Pedley 4022* (BRI); 23.2 km along Burncluith road, Barakula S.F., Oct 1993, *Slee 3441* (BRI); *c.* 13.1 miles [21.1 km] W of Condamine River on Moonie Highway, May 1961, *Smith 11321* (BRI); Bybera, via Inglewood, May 1934, *White 10059* (BRI). **New South Wales.** 28 miles [45 km] S of Gilgandra, Oct 1976, *Carr & Carr 352* (AD, BRI, CANB, MEL, NSW); Pilliga Scrub, Oct 1976, *Carr & Carr s.n.* (BRI, CANB, MEL, NSW); Pilliga Scrub, 25 km E of Baradine, Dec 1973, *Streimann 703* (BRI, CANB).

***Distribution and habitat*:** *E. elegans* extends from Eidsvold to Inglewood in Queensland, and again in the Narrabri – Gilgandra area of New South Wales (**Map 1**). It grows on flat or gently undulating ground with sandy soil near the surface. Common associates are *Callitris glaucophylla* and *Casuarina luehmannii*.

***Phenology*:** Flowers are recorded from June to December; fruits may be found all year round.

***Notes*:** *Eucalyptus elegans* is distinguished by its tall habit, straight trunk, linear juvenile leaves, mostly linear adult leaves, and very small buds and fruits. In the Chinchilla and Inglewood areas, it often grows in close proximity to *E. crebra*, but without intergradation, with *E. crebra* favouring the more hilly terrain.

***Conservation status*:** The species is common and widespread. No conservation coding is required.

***Etymology*:** From the Latin *elegans* meaning elegant, attractive. This is a reference to the form of the tree and the appearance of the crown.

Eucalyptus bowmanii Benth.

Bentham (1867) described *E. bowmanii* on the basis of a single specimen collected by Edward Bowman. This specimen, although in flower, is deficient in many ways. All of the opercula have been shed from the flowers, and none remains with the specimen. There are just two inflorescences, no fruits, and only five leaves. There is no collecting locality, other than 'Queensland', and there is no indication of bark type.

Because of the incomplete nature of the specimen and lack of location and other information, the identity of *E. bowmanii* has long been in doubt. Maiden (1909) considered it to be a doubtful species, either conspecific with *E. hemiphloia* (=*E. moluccana*), or closely related to it. Blakely (1934) accepted it as a distinct species, placing it alongside *E. drepanophylla*. Pryor and Johnson (1971) regarded it as a synonym of *E. fibrosa* subsp. *fibrosa*. G.M. Chippendale examined the type specimen in 1973 and determined it as *E. fibrosa* subsp. *fibrosa*.

The present author has also recently examined the type of *E. bowmanii*, and concurs that *E. bowmanii* is conspecific with *E. fibrosa* subsp. *fibrosa*. A brief description, gleaned from the type specimen, is given here:

Adult leaves lanceolate, 23–34 mm wide, lateral veins at around 45 degrees to the midrib,

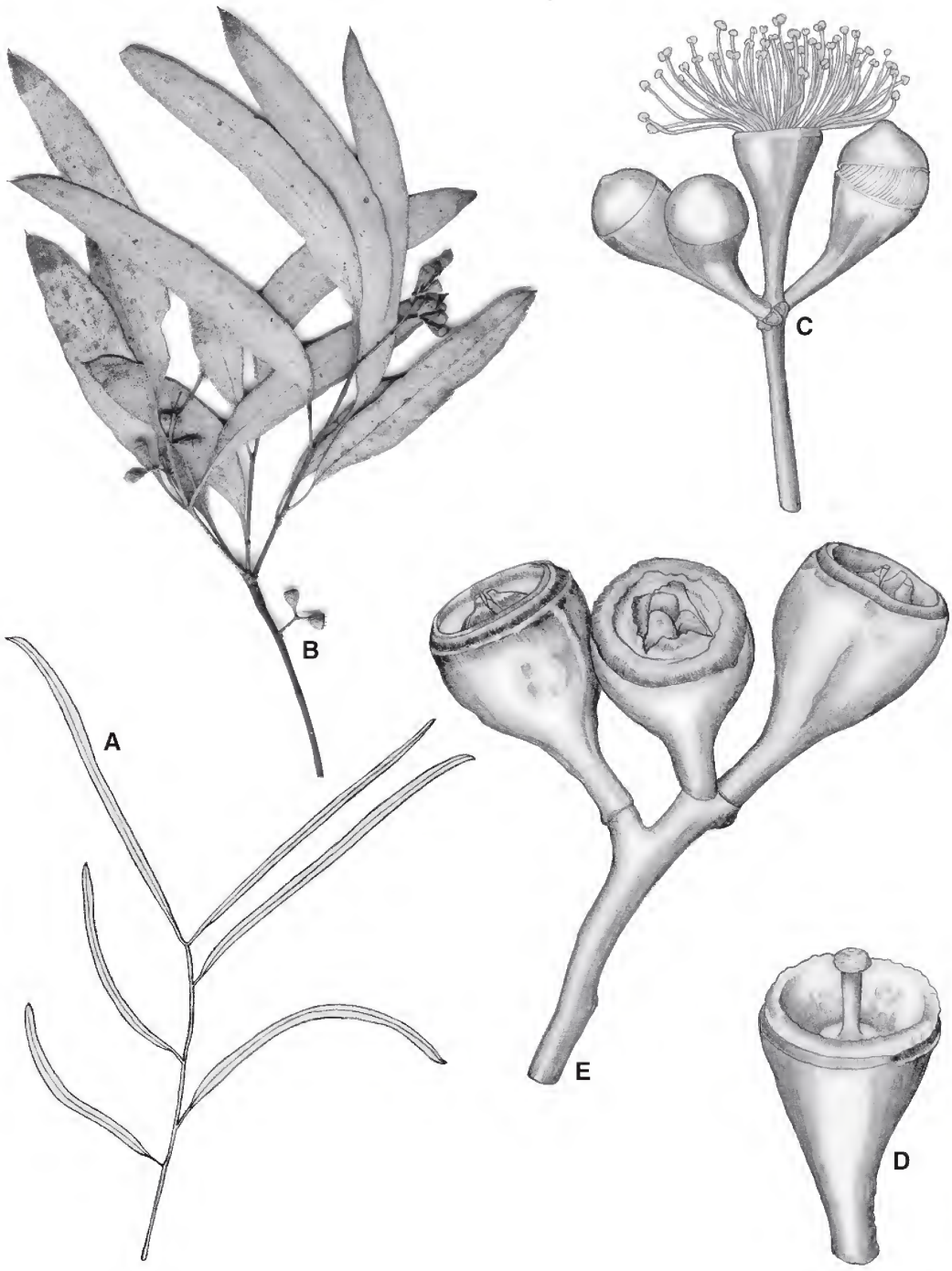


Fig. 1. ***Eucalyptus elegans.*** A. juvenile leaves ×0.8. B. branchlet bearing axillary bud clusters and fruits ×0.8. C. umbel of mature buds (some buds have been shed) ×4. D. hypanthium (at anthesis, stamens removed) showing staminophore and style ×8. G. mature fruits ×8. A from *Bean 16658* (BRI); B-E from *Bean 15864* (BRI). Del. W. Smith.

intramarginal vein *c.* 1.5 mm from margin, petioles 18–23 mm long. Inflorescences axillary, 7-flowered; peduncles *c.* 14 mm long, *c.* 3 mm wide at apex, angular; pedicels indistinct, thick, angular; floral hypanthia (including pedicel) narrowly obconic, 7–8 mm long, 4–4.6 mm wide at distal end; staminophore *c.* 0.5 mm wide; stamens white; anthers adnate, basifixed.

The basifixed adnate anthers confirm its placement in *E.* sect. *Adnataria*. The two axillary inflorescences present on the specimen would suggest otherwise, as species in this section are noted for their terminal inflorescences, but they can and do have some axillary umbels as well. The type of *E. bowmanii* appears to coincide with the form of *E. fibrosa* subsp. *fibrosa* that grows around Glen Geddes and Marlborough, north of Rockhampton. The recent collections of *Batianoff 9812232 et al.*, *Anderson s.n.*, and *Batianoff 91081 & Robins*, (all held at BRI), match the type almost perfectly.

Eucalyptus tholiformis A.R.Bean & Brooker, *Austrobaileya* 4(2): 187 (1994). **Type:** Queensland. Leichhardt District: Salvator Rosa National Park, on ridge east of the Sentinel, 18 May 1986, *A.R. Bean 444* (holo: BRI; iso: BRI, MEL).

E. sp. (Rewan H.A.Kerswell 1) in Henderson (2002)

***Selected specimens examined*: Queensland.** Leichhardt District: 19.8 km from Goonyella turnoff towards Clermont, Aug 1986, *Bean 504* (BRI); Nathan Gorge, Oct 1989, *Bean 1138* (BRI); Lookout track, S.F. 236, SW of Blackwater, Nov 2002, *Bean 19571* (BRI); 'Alice Wells' on northern boundary of Mt Playfair Station, Aug 1977, *Blaxell 1448 & Armstrong* (BRI, NSW); near Yoothapinna Holding NW of Injune, Apr 1975, *Brooker 4856* (BRI, CANB); 12.5 km from Mantuan Downs turn-off towards Springsure, Oct 1987, *Brooker 9781* (BRI); 83.7 km W of Springsure on Tambo road, Aug 1984, *Hill 1196 et al.* (BRI, CANB, DNA, MEL, NSW, PERTH); SE Boundary of Rewan Holding, Portion 3 Wyseby, Apr 1987, *Kerswell 1* (BRI); Expedition Range, 27 km ESE of Rolleston township, Aug 1961, *Lazarides & Story 17* (BRI, CANB). South Kennedy District: 69 km from Alpha towards Tambo, Dec 1988, *Hill 3607 & Stanberg* (BRI, CANB, NSW). Maranoa District: road to West Branch Camp, Mt Moffatt N.P., Dec 1997, *Bean 12845* (BRI, CANB).

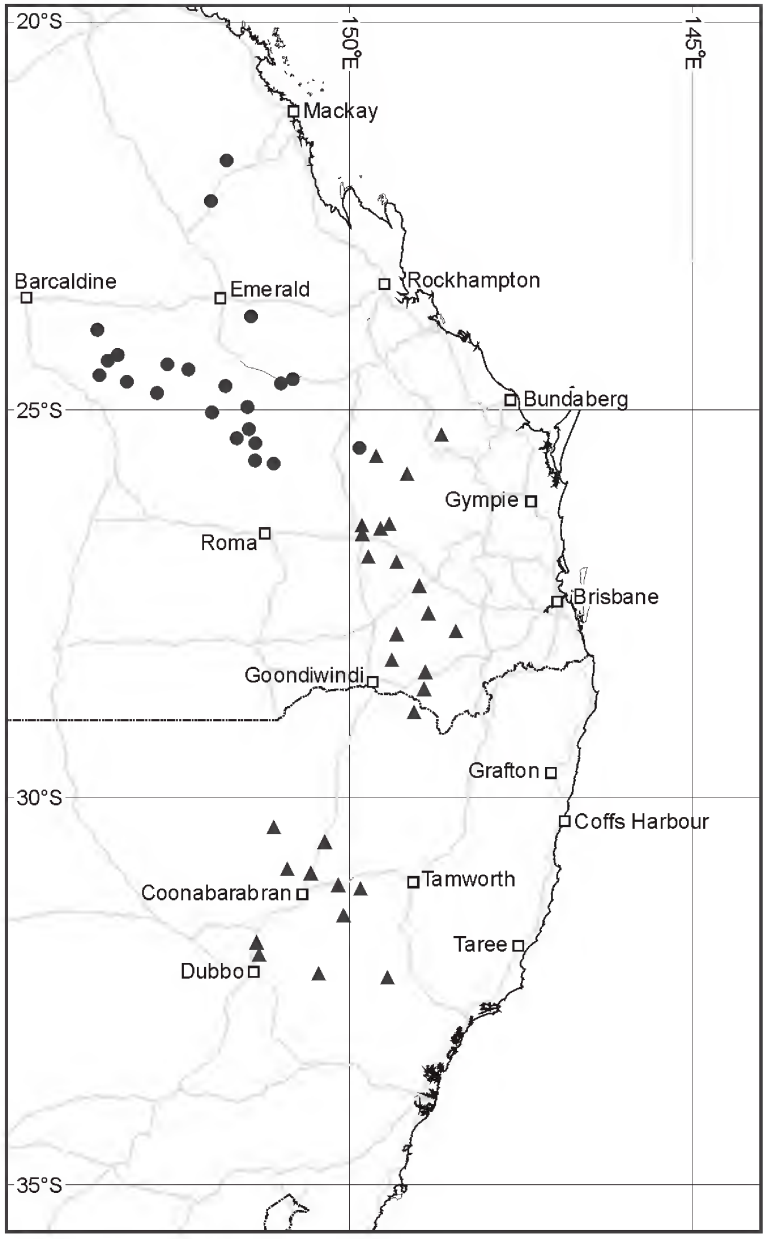
***Notes*:** The circumscription of this species has been expanded to include populations with a lesser amount of smooth bark on the upper branches than at the type locality, and fruits with a level or descending disc. These populations were previously included under *E.* sp. 'Rewan'. The distribution of *E. tholiformis* is hence extended considerably to the east (**Map 1**). All of these forms are united by the juvenile leaves that are consistently broadly ovate, and 55–95 × 25–50 mm.

Eucalyptus crebra F.Muell. and **Eucalyptus drepanophylla** Benth.

These two species are at the heart of the taxonomic problems in the ironbarks, and specimens from some locations e.g. Nebo, Marlborough, are difficult to assign. However, in other areas (e.g. Pentland, Clairview) they co-occur without intergradation. The main distinguishing characters are given in the table below.

Table 1. Morphological comparison of *Eucalyptus crebra* & *E. drepanophylla*

Character	*E. crebra*	*E. drepanophylla*
junction of operculum and hypanthium (immature buds)	no constriction	distinct constriction, sometimes referred to as egg-in-eggcup
rim of fruit (comprising staminophore and part of disc)	0.4–0.8 mm wide	0.7–1.2 mm wide
juvenile leaves	linear to narrowly lanceolate, grey to blue-grey, not glossy	lanceolate, often pale lime-green, sometimes +/- glossy



Map 1. Distribution of *Eucalyptus tholiformis* ● and *E. elegans* ▲.

The traditional distinctions made between these species, i.e. larger adult leaves, buds and fruits for *E. drepanophylla*, do not hold, although *E. drepanophylla*, on average, has broader adult leaves than *E. crebra*.

Key to the narrow-leaved ironbarks (*Eucalyptus* subser. *Subglaucae*)

1 Buds and fruits with 4 obvious longitudinal ribs 2
Buds and fruits with 1–2 faint ribs, or ribs absent 3

2 Adult leaves ovate to orbicular, 3–6 cm wide; branchlets pruinose; pedicels 3–5 mm long . . . . . **E. farinosa**
Adult leaves lanceolate, 1.5–2.2 cm wide; branchlets not pruinose; pedicels 5–7 mm long . . . . . **E. quadricostata**

3 Apex of some or all adult leaves obtuse or retuse 4
Apex of all adult leaves acute to acuminate 5

4 Leaves lemon scented; fruits 5–6.5 mm long, pedicels 4–6 mm long . . . . . **E. staigeriana**
Leaves not lemon scented; fruits 3.5–5.5 mm long, pedicels 0–2mm long . . . . . **E. jensenii**

5 Inflorescences predominantly simple, axillary . . . . . **E. rhombica**
Inflorescences predominantly compound, terminal 6

6 Juvenile leaves broadly-ovate to orbicular (<2.5 times longer than wide) 7
Juvenile leaves more than 2.5 times longer than wide 10

7 Juvenile leaves 2.5–5 cm wide 8
Juvenile leaves 5–12 cm wide 9

8 Outer branches smooth; adult leaves 15–30 mm wide . . . . . **E. tholiformis**
Bark rough throughout; adult leaves 10–20 mm wide . . . . . **E. fracta**

9 Buds and branchlets pruinose; fruits 6–8 mm long; umbels 7–11 flowered . . . . . **E. fibrosa** subsp. **nubila**
Buds and branchlets not pruinose; fruits 7–12 mm long; umbels 5–9 flowered . . . . . **E. fibrosa** subsp. **fibrosa**

10 Outer branches (up to 6 cm diameter) conspicuously smooth barked 11
Smooth bark absent or confined to branches <2.5 cm diameter 13

11 Branches 6–12 cm diameter smooth-barked . . . . . **E. decorticans**
Branches 6–12 cm diameter rough-barked 12

12 Juvenile leaves green, lanceolate, 1.5–2.5 cm wide . . . . . **E. taurina**
Juvenile leaves grey-green, linear, 0.8–1.3 cm wide . . . . . **E. beaniana**

13 Immature buds egg-in-eggcup 14
Immature buds without any constriction 16

14 Juvenile leaves glaucous . . . . . **E. paedoglauca**
Juvenile leaves green to grey-green, not glaucous 15

15 Fruits large, 5–8 × 5–8 mm; mature buds egg-in-eggcup . . . . . **E. xanthoclada**
Fruits small, 4–6 × 4–5 mm; mature buds without constriction . . . . . **E. drepanophylla**

16 Juvenile leaves linear to narrowly lanceolate (7–20 times longer than wide) 17
Juvenile leaves lanceolate to ovate (2.5–7 times longer than wide) 20

17 Fruiting disc broad and convex . . . . . **E. cullenii**
Fruiting disc narrow, descending 18

18 Adult leaves lacking intramarginal vein . . . . . **E. exilipes**
Adult leaves with intramarginal vein 19

19 Juvenile leaves 2.5–6 mm wide; fruits 2.5–4 mm long . . . . . **E. elegans**
Juvenile leaves 6–14 mm wide; fruits 4–7 mm long . . . . . **E. crebra**

20 Adult leaves bright green, quite glossy; juvenile leaves subsessile . . . . . **E. granitica**
Adult leaves blue-grey to green but not glossy; juvenile leaves distinctly petiolate 21

21 Operculum hemispherical to ellipsoid-truncate, apex obtuse 22
Operculum conical, apex acute 23

22 Buds and branchlets usually pruinose; operculum hemispherical . . . . . **E. atrata**
Buds and branchlets never pruinose; operculum ellipsoid-truncate . . . . . **E. ophitica**

23 Fruits typically ellipsoid-truncate; adult leaves 10–18 mm wide . . . . . **E. whitei**
Fruits cupular to obconical; adult leaves 18–30 mm wide . . . . . **E. siderophloia**

Acknowledgements

I am very grateful to Maurice McDonald for his encouragement and discussions, his logistical support during the field component of the work, and for organising and supervising the allozyme analysis for the ironbarks. Ian Brooker has provided support and encouragement over many years, and first suggested a revision of the ironbarks to me two decades ago. My numerous taxonomic discussions with him have been invaluable. I also thank Will Smith for the illustration and map, and Les Pedley for the Latin diagnosis.

References

Achour, P. (2003). Phylogeny in the Red Ironbarks (*Eucalyptus* series *Siderophloiae*). http://www.anbg.gov.au/cpbr/summer-scholarship/2003-projects/achour-ironbark.html

Bean, A.R. & Brooker, M.I.H. (1994). Four new species of ironbark (*Eucalyptus* L'Herit., Myrtaceae) from southern Queensland. *Austrobaileya* 4: 187–94.

Bentham, G. (1867). *Eucalyptus*. In *Flora Australiensis* 3: 185–261. L.Reeve & Co.: London.

Blakely, W.F. (1934). *A Key to the Eucalypts*. The Worker Trustees: Sydney.

Brooker, M.I.H. (1985). The Ironbarks allied to *Eucalyptus crebra* F.Muell. and the description of a new species, *E. quadricostata*, in the group. *Austrobaileya* 2: 148–152.

Brooker, M.I.H. (2000). A new classification of the genus *Eucalyptus* L'Her. (Myrtaceae). *Australian Systematic Botany* 13: 79–148.

Brooker, M.I.H. & Bean, A.R. (1987). Two new ironbarks and a new bloodwood (*Eucalyptus*, Myrtaceae) from Queensland. *Brunonia* 10: 189–200.

Brooker, M.I.H. & Kleinig, D.A. (1994). *Field Guide to Eucalypts*, Volume 3. Inkata Press: Sydney.

Brooker, M.I.H. & Slee, A.V. (2000). Studies in the Red Gums of South-eastern Australia with particular emphasis on *Eucalyptus* subser. *Erythroxyla*. *Australian Forestry* 63: 86–106.

Chippendale, G.M. (1988). *Flora of Australia* Volume 19, Myrtaceae, *Eucalyptus, Angophora*. Australian Government Publishing Service: Canberra.

Henderson, R.J.F. (ed.) (2002). *Names and Distribution of Queensland Plants, Algae and Lichens*. Environmental Protection Agency: Brisbane.

Hill, K.D. (1997a). New species in *Angophora* and *Eucalyptus* (Myrtaceae) from New South Wales. *Telopea* 7: 97–109.

Hill, K.D. (1997b). New taxa in *Eucalyptus* (Myrtaceae) from New South Wales and Queensland. *Telopea* 7: 187–98.

Hill, K.D. & Johnson, L.A.S. (1991). Systematic studies in the eucalypts - 4; New taxa in *Eucalyptus* (Myrtaceae). *Telopea* 4: 321–49.

Holman, J. (2002). Clines, species and eucalypts: an evolutionary perspective. Unpublished Ph.D. thesis. Griffith University: Nathan. http://www4.gu.edu.au:8080/adt-root/uploads/approved/adt-QGU20030527.124144/public/02Whole.pdf

Johnson, L.A.S. & Hill, K.D. (1990). New taxa and combinations in *Eucalyptus* and *Angophora* (Myrtaceae). *Telopea* 4: 37–108.

Leichhardt, L. (1847). *Journal of an Overland Expedition in Australia*. T. & W. Boone: London. facsimile edition.

Maiden, J.H. (1909). *Critical Revision of Eucalyptus, Part X*. Government Printer: Sydney.

Pryor, L.D. & Johnson, L.A.S. (1971). *A Classification of the Eucalypts*. Australian National University: Canberra.

Backhousia enata A.J.Ford, Craven & J.Holmes (Myrtaceae), a new species from north-eastern Queensland

A.J. Ford[1], L.A. Craven[2] & J.J. Brophy[3]

Summary

Ford, A.J., Craven, L.A. & Brophy, J.J. (2005). *Backhousia enata* A.J.Ford, Craven & J.Holmes (Myrtaceae), a new species from north-eastern Queensland. *Austrobaileya* 7(1): 121–127. *Backhousia enata* A.J.Ford, Craven & J.Holmes is described, illustrated and compared with a putatively related species. Notes on habitat, distribution, conservation status and an analysis of essential oils are provided. The oil profile of the new species is most similar to that of *B. sciadophora* F.Muell. whereas morphologically *B. enata* is very similar to *B. myrtifolia* Hook. & Harvey, to which we believe it is most closely related. A revised key to the species of *Backhousia* is presented.

Key Words: Myrtaceae, taxonomy, identification key, Australia, Queensland flora, *Backhousia enata,* essential oils.

[1]A.J. Ford, CSIRO, Sustainable Ecosystems and Rainforest-CRC, Tropical Forest Research Centre, PO Box 780, Atherton, Queensland 4883, Australia

[2]L.A. Craven, Australian National Herbarium, CPBR, CSIRO Plant Industry, GPO Box 1600, Canberra, ACT 2601, Australia

[3]J.J. Brophy, School of Chemistry, University of New South Wales, UNSW, Sydney, New South Wales 2052, Australia

Introduction

Backhousia is a genus of about nine species of trees and shrubs and is endemic to Australia (Guymer 1988; Bean 2003). The relationships of the genus are with another Australian endemic genus, *Choricarpia*, with which it shares a distinctive embryo type (Wilson *et al.* 2001). One of the species, *Backhousia citriodora* F.Muell., is cultivated for its essential oils that are used as flavouring in the food industry (Doran *et al.* 2001).

During routine and targetted botanical surveys for the Rainforest Co-operative Research Centre (Rainforest-CRC), an unusual member of the Myrtaceae was observed and collected along the Tully River, north-eastern Queensland. Subsequent visits yielded both flowering and fruiting specimens, examination of which indicated to us that it was a new species of *Backhousia*. Accordingly, *B. enata* is described below.

To complement a recent survey of the essential oils of *Backhousia* (Brophy *et al.* 1995), samples of *B. enata* foliage were obtained and the essential oils analysed.

Accepted for publication 30 June 2005

Taxonomy

Backhousia enata A.J.Ford, Craven & J.Holmes, **sp. nov.** A *B. myrtifolia* Hook. & Harvey ramulis 4-alatis, bracteis brevioribus (2–2.6 mm longis), lobis calycis brevioribus (1.9–2.2 mm longis), petalis complanatis usque cucullatis, stylo breviore (2.2–3.3 mm longo) differt. **Typus:** Queensland. North Kennedy District: Alcock Forest Reserve, rafting access point No. 9, 5.2 km from Tully River Camping Area [NW of Tully], 14 January 2003, *A. Ford 3792*, *G. Sankowsky & N. Sankowsky* (holo: BRI; iso: CANB, K, L, MEL, MO, NE, NSW, QRS, SYD).

Backhousia sp. (Tully River) in Cooper & Cooper (2004: 342)

Single to multistemmed large shrubs or trees, 5–15 m high; trunk diameters to 20 cm; buttresses absent; trees usually with numerous coppice shoots and smaller juvenile plants with coppice and vegetative self-layering shoots; bark of main trunk rough, minutely fissured, more or less flaky, grey-brown; upper branches mostly smooth, developing a flaky character with increasing age; outer blaze (and wood) tan, very fibrous. Spreading to antrorse, colourless

to whitish uniseriate hairs to 0.7mm long present on branchlets, leaves, petioles, inflorescence axes, stipe, hypanthia and calyx lobes. Branchlets conspicuously winged, the wing extending from the base of each side of the petiole to the node below; puberulent, hairs to 0.7 mm long; gland dotted; the branchlets becoming glabrous and terete with age. Stipules two or three, moderately persistent, ferrugineous, setose, filiform, to 1.1 mm long. Juvenile and adult leaves similar. Cataphylls to 13 x 6 mm, usually inserted proximally on each vegetative growth unit, occasional vestigial cataphylls (lacking any lamina but inserted at a node) present amongst optimally developed leaves. Leaves opposite, petiolate, decussate, discolorous, dull on adaxial surface and shiny on abaxial surface; lamina ovate to elliptic-obovate, 24–38 × 11–18 mm, base cuneate to roundly cuneate, apex acute to acute-acuminate; margin flat or slightly recurved; both surfaces with hairs to 0.4 mm long, densest along the midvein, more or less glabrescent except for the midvein; midvein raised on each surface, more prominent on adaxial surface; oil glands moderately dense and conspicuous on each surface; venation brochidodromous, inconspicuous on adaxial surface, primary venation conspicuous on abaxial surface, secondary venation discernible, tertiary venation not discernible, 8–12 primary lateral veins on each side of midvein; intramarginal vein complete, 0.4–0.8 mm from margin, indented to slightly looping at junction with lateral veins. Petioles 1.5–4 mm long, channelled on adaxial surface, puberulent, glandular. Inflorescences in the upper leaf axils, paniculate, composed of three to (usually) six flowers, the central flower position of the inflorescence aborted and often represented by a caducous, hairy, linear and bract-like appendage *c.*1 mm long; primary inflorescence axis 6–10 mm long, weakly 4-angled (not terete) and with shallow longitudinal grooves on the abaxial and adaxial surfaces, hairs to 0.7 mm long; secondary inflorescence axis 1.9–2.1 mm long, hairs to 0.7 mm long. Bracts elliptic-ovate, 2.0–2.6 × 1.0–1.2 mm, caducous, apex obtuse to bluntly acute, abaxial surface with hairs mostly in proximal half and on the keeled midvein, adaxial surface glabrous, margin hairy, oil glands conspicuous. Bracteoles 1.5–2.0 mm long, narrowly elliptic, abaxial surface with hairs mostly on the keeled midvein, adaxial surface glabrous, oil glands conspicuous, red-brown to orange-brown finger-like colleters *c.* 0.15 mm long inserted between bracteoles and at the base of the bracts. Flowers white, perigynous. Hypanthium stipitate, campanulate, 2.7–3.3 mm × 2.2–2.4 mm including stipe, the outer surface with hairs, glabrous inside except for scattered hairs on the swollen disc adjacent to the calyx lobes and the filaments, stipe 1.0–1.3 × *c.* 0.7 mm. Calyx lobes 5, persistent, accrescent, flat, spreading, greenish, sub-equal (3 outer and 2 inner), ovate to triangular, 1.9–2.2 × 1.6–2.2 mm, apices obtuse (outer) or bluntly acute (inner); on abaxial surface moderately hairy more so in proximal half, glabrous to minutely puberulent on adaxial surface, oil glands conspicuous. Petals caducous, 5, white, flat to cucullate, 1.8–2.0 × 1.6–1.9 mm, shortly clawed, ovate to nearly orbicular, glabrous, obscurely veined, oil glands sparse, alternating with calyx lobes. Stamens 56–70, in two whorls; filaments free, of variable length in the same flower, 1–3.6 mm long, very slender and becoming thread-like towards the apex, glabrous; anthers dorsifixed, versatile, *c.* 0.15 × 0.2 mm, dehiscing laterally through longitudinal slits. Style 2.2–3.3 mm long, minutely hairy to ± glabrous, with sparse oil glands, straight, tapering slightly towards the apex, inserted in a shallow depression on the ovary summit, stigma punctiform; ovary *c.* 1 mm wide, summit glabrous or with scattered hairs, flat to slightly convex, with a row of hairs *c.* 0.2 mm long on the periphery of the ovary wall which extend above the ovary, adnate to the hypanthium for about half the ovary length, 2-locular, 6 or 7 ovules per locule, placentas axile. Fruit dry, indehiscent, 2–2.2 × 2–2.3 mm excluding calyx lobes; calyx lobes spreading, to 5 × 4 mm; style elongating to *c.* 5 mm following anthesis, puberulous. Seeds 5–7 per locule, *c.* 1 mm long, 3-faced with the abaxial face convex. **Fig. 1.**

***Additional specimens examined*: Queensland.** NORTH KENNEDY DISTRICT. Alcock Forest Reserve, rafting access point No. 9, 5.2 km from Tully River Camping Area, Feb 2002, *Ford 3275 & Holmes* (BRI, QRS); *loc. cit.*, Dec 2002, *Ford 3780 & Holmes* (BRI, CANB, L, MEL, NSW, QRS); *loc. cit.*, Mar 2003, *Ford 3844, Holmes & Cameron* (BRI, CANB); Tully River, Apr 2002, *Cooper & Cooper WWC1727* (QRS); near Carter Creek Falls above Carter Creek, Walter Hill Range, *c.* 20 km S of Millaa Millaa, Jul 2003, *Graham s.n.* (BRI, QRS).

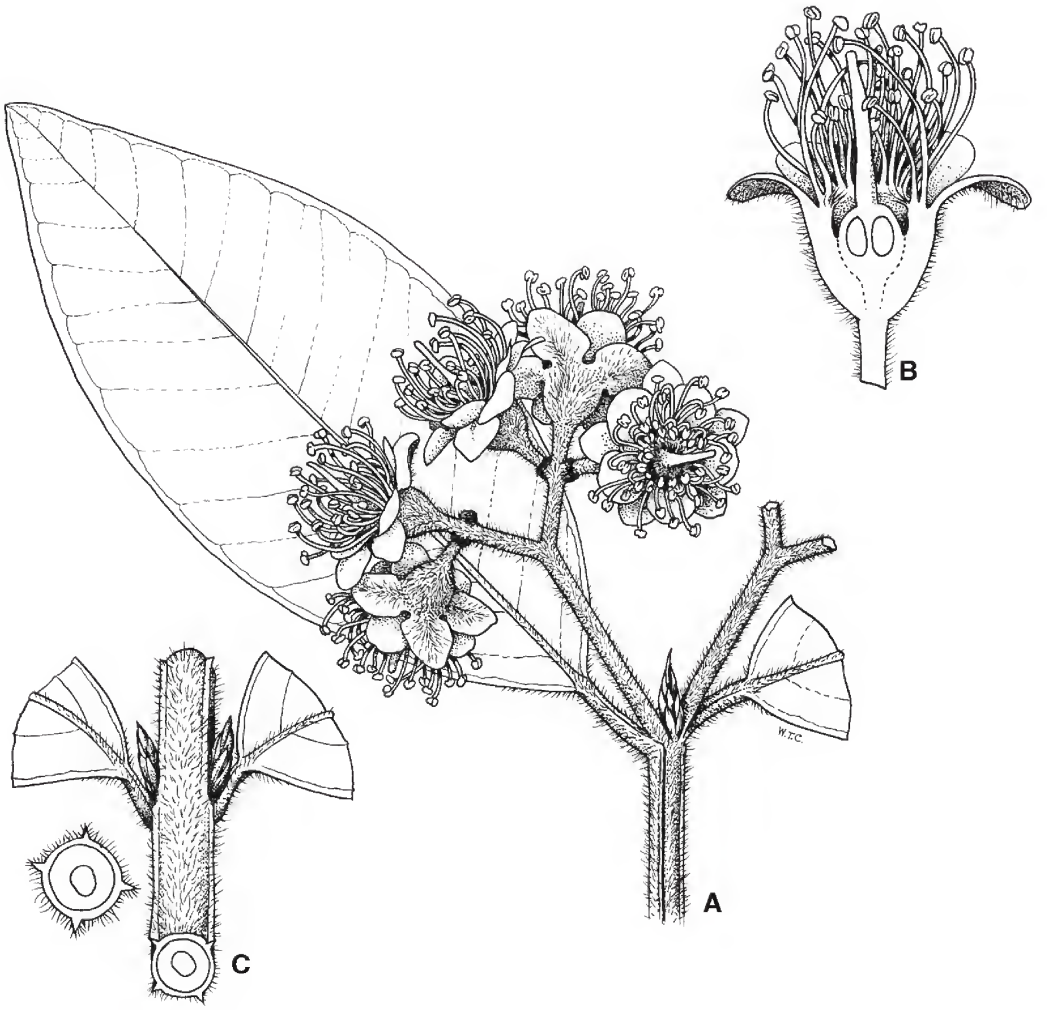


Fig. 1. ***Backhousia enata.*** A. flowering branchlet ×4. B. half flower ×6. C. branchlet habit, showing wings ×6. All from *Ford 3792* (QRS). Del. W.T. Cooper.

***Distribution and habitat*:** *Backhousia enata* is endemic to the Wet Tropics bioregion in north-eastern Queensland, where it is currently known to occur only in the Tully River catchment, north-west of Tully (**Map 1**). It inhabits notophyll vine-forest/rainforest on soils derived from rhyolite and basalt. At the type locality, which is riparian and where the substrate is rhyolite, canopy species include *Xanthostemon chrysanthus*, *Buckinghamia celsissima, Pseudoweinmannia lachnocarpa, Carnarvonia araliifolia, Syzygium tierneyanum* and *Carallia brachiata.* Small trees and shrubs at this locality include *Bursaria tenuifolia, Atractocarpus fitzalanii, Chionanthus ramiflorus, Croton triacros, Codiaeum variegatum* var. *moluccanum, Mallotus polyadenos* and *Schefflera actinophylla.* However, in the Carter Creek area, which is on a razor ridge with a basalt substrate, *Agathis robusta* is the dominant canopy tree. Here the understorey is very sparse and consists of *Hedraianthera porphyropetala, Alyxia ilicifolia, Hoya australis* and *Peperomia blanda* var. *floribunda.* Altitudinal range, from existing specimens, is 80–310 m.

***Phenology*:** Flowers have been recorded in January; fruits have been recorded in March.

***Notes*:** On morphological features, *B. enata* appears to be most closely related to *B. myrtifolia*, and will key to that species in Guymer (1988). It differs in critical features highlighted in **Table 1**. In addition, *B. myrtifolia* and *B. enata* are geographically separated, using current data, by about 1,000 km.

The winged condition of adult branchlets in *B. enata* is unusual within the genus. Some species of *Backhousia,* e.g. *B. bancroftii*, *B. myrtifolia* and *B. hughesii,* exhibit winged stems but only when either at the seedling or small sapling stage, or on coppice shoots, not on adult specimens.

Special mention needs to be made of some aberrant and widely disjunct fertile specimens of *B. myrtifolia*, *viz.* Camira (Qld), *Bird s.n.* (BRI[AQ563613]) (BRI); Border Ranges National Park (NSW), *Forster PIF15109* (BRI); Miriam Vale (Qld), *Brushe TOI208* (BRI) and Albion Park (NSW), *Pullen 4239* (BRI). These collections have very slight ridges on the adult branchlets. Furthermore, the dimensions at the lower extremes of measurements listed in **Table 1** within *B. myrtifolia* are mostly attributable to the *Bird s.n.* specimen. The *Bird s.n.* collection vouchered an essential oil analysis reported upon by Brophy *et al.* (1995); significantly, the oils were consistent with those in other sampled populations of *B. myrtifolia*. As the aforementioned specimens lack the distinctive features of *B. enata* listed in **Table 1**, they should be regarded as merely morphologically atypical forms of *B. myrtifolia.*

The leaves of *B. enata* are recorded as being aromatic with a menthol-like smell. New growth is red-purple. Its flowers lack any distinctive odour.

The three outer calyx lobes are unusual in that they have a thickened brown-red-purple margin, whereas the two inner calyx lobes usually lack this combined feature, presumably this is a function of these tissues being exposed in the bud stage. Of all the *B. myrtifolia* specimens examined, only *Brushe TOI208* has calyx lobes with thickened margins. Although not mentioned on the label, it is possible that these thickened margins were coloured when fresh and therefore similar to the calyx lobe condition of *B. enata.* In addition to the stipules that occur on each side of the petiole, several short, colleter-like structures are inserted between the axillary bud and the adaxial surface of the petiole. These structures appear to be homologous with similar structures discussed by Weberling (1966) for *Kania* Schltr., by Weberling (2000) for *Tepualia* Griseb. and by Craven (1987) with respect to their occurrence in *Calytrix* Labill.

The leaf oil of *B. enata* is dominated by monoterpenes and these compounds accounted for approximately 90% or more of the oil, the remainder being sesquiterpenes. Our analysis (voucher, *Ford 3792)* showed that the principal components were α-pinene (14–17%) and β-pinene (36–42%), with terpinen-4-ol (5–8%) and p-cymene (2–5%) being the next most abundant components. The major sesquiterpene was spathulenol (3–5%), with no other sesquiterpene being greater than 1.5%. No aromatic components were detected in the oil of this species.

The composition of the oil from *B. enata* bears no similarity to that obtained from *B. myrtifolia*, the major components of which, either singly or together, are the aromatic ethers: methyl eugenol, E-methyl isoeugenol and elemicin (Brophy *et al.* 1995). The oil of *B. enata* is most similar to that obtained from *B. sciadophora* F.Muell. which contained significant amounts of α-pinene(44–55%), β-pinene (2–8%) and limonene (6–13%). In this species too, monoterpenes accounted for greater than 90% (Brophy *et al.* 1995). No samples were analysed from the Carter Creek populations.

***Conservation Status*:** All existing collections have been made within the World Heritage Area of the Wet Tropics bioregion. As this species has only recently been discovered it is premature to discuss its conservation status. Currently there are four known discrete populations, with the total number of individuals being less than 200. A preliminary search of the Tully River in adjacent, and suitable, riparian habitats failed to detect any further individuals. However, as there are an estimated 100 plants in the Carter Creek area (Graham, pers comm. 2003) it is not unexpected that several more populations may exist within the poorly known and rugged expanse of the Koolmoon, Cochable

Table 1. Differences between *B. enata* and *B. myrtifolia*. Dimensions of floral parts refer to flowers at anthesis only, as calyx lobes and style elongate during fruit maturation.

Character	*B. enata*	*B. myrtifolia*
Branchlet shape (on adult and fertile branchlets only)	conspicuously winged	terete (very rarely with slight ridges)
Bract shape	elliptic-ovate	narrow ovate-narrow elliptic
Bract dimensions	2.0–2.6 × 1.0–1.2 mm	3.5–6.1 × 1.1–2.0 mm
Primary inflorescence axis length	6–10 mm	14–40 mm
Calyx lobe dimensions	1.9–2.2 × 1.6–2.2 mm	3.1–11.0 × 1.6–5.0 mm
Outer calyx lobe apex	obtuse	acute
Petal dimensions	1.8–2.0 × 1.6–1.9 mm	2.1–3.8 × 1.7–3.0 mm
Style length	2.2–3.3 mm	5.0–8.1 mm

and Cannabullen Creek catchments. Therefore it is appropriate to give *B. enata* a Data Deficient (DD) status using the guidelines of the IUCN (2001).

***Etymology*:** The specific epithet is from the Greek, *enatos*, ninth, and refers to the locality, Access point 9, on the Tully River. It was at this locality that the type collection was made.

The following key is based upon that given in Guymer (1988) with the addition of *Backhousia oligantha* A.R.Bean and the present species. *B. anisata* Vickery was removed by Wilson *et al.* (2000) to a new genus allied to *Syzygium* Gaertn., *Anetholea* Peter G. Wilson. However, the distinction of *Anetholea* from *Syzygium* is slight and the species has been transferred to the latter genus (Craven & Biffin 2005).

Key to the species of *Backhousia*

1. Hypanthium stipe filiform (*c.* 0.25 mm diameter), (6–)8–18 mm long 2
   Hypanthium stipe slender (*c.* 0.5 mm diameter), 0.5–8 mm long 6

2. Leaves lemon-scented, narrow ovate, apex acuminate; branchlets and inflorescences pubescent. SE Qld to NE Qld . . . . . **B. citriodora** F.Muell.
   Leaves not lemon-scented, orbicular, ovate, obovate, or narrow obovate, apex obtuse; branchlets and inflorescences puberulent or glabrous 3

3. Inflorescences of 3–11 dichasial clusters, 5–7 cm long; inner calyx lobes 4–5 mm long. NE Qld. . . . . **B. hughesii** C.T.White
   Inflorescences of 1or 2 (or 3) dichasial clusters, 3–5 cm long; inner calyx lobes 2–2.5 mm long 4

4. Inflorescence axes and hypanthia glabrous; leaves orbicular to ovate, (4–)5–7.8 × 2.5–3.5 cm. SE Qld to NE NSW . . . . . **B. sciadophora** F.Muell.
   Inflorescence axes and hypanthia puberulent 5

5. Trunk bark shed in strips; leaves ovate, obovate or narrow obovate; inflorescences 8–20–flowered. CE Qld to SE Qld . . . . . **B. kingii** Guymer

Trunk bark deciduous throughout; leaves elliptic or narrow ovate; inflorescences (1–)3–flowered. CE Qld to SE Qld ..... **B. oligantha** A.R.Bean

6. Trunk bark deciduous throughout. CE Qld to SE Qld ..... **B. oligantha** A.R.Bean
Trunk bark rough, persistent throughout 7

7. Inflorescences terminal and axillary. NE Qld ..... **B. bancroftii** F.M.Bailey & F.Muell. ex F.M.Bailey
Inflorescences axillary 8

8. Adult branchlets conspicuously winged. NE Qld .... **B. enata** A.J.Ford, Craven & J.Holmes
Adult branchlets unwinged (rarely 4-ridged) 9

9. Leaves ovate to narrow ovate, 2.2–6.5 × 0.9–4 cm; calyx lobes +/- equal, 5–13 mm long in fruit. SE Qld to SE NSW ..... **B. myrtifolia** Hook. & Harvey
Leaves narrow ovate to linear-oblong, 1.7–3.4 × 0.4–1 cm; inner calyx lobes larger than outer, 2–3 mm long in fruit. NE NSW to NE Qld ..... **B. angustifolia** F.Muell.

Acknowledgements

The authors wish to thank Bill Cooper for the illustrations. Peter Bostock provided the distribution map. Field assistance was provided to the first author by Wendy Cooper, Gary and Nada Sankowsky and Bob Hewett. Maurie Tucker, Kris Kupsch and Nan Nicholson supplied additional useful information. Bob Goldsack is thanked for help with the oil distillations. Permits to collect in Alcock Forest Reserve were issued by the Queensland Parks and Wildlife Service. Andrew Graham (ex-CSIRO) provided the information and specimen for the Carter Creek populations. Peter Wilson gave useful suggestions to the first author during a visit to NSW. The curators and staff at BRI, CANB, NSW and QRS are thanked for allowing access to specimens and the use of their facilities. An anonymous referee is thanked for their useful comments.

References

Bean, A.R. (2003). *Backhousia oligantha* (Myrtaceae), a new species from Queensland. *Austrobaileya* 6: 533–536.

Brophy, J.J., Goldsack, R.J., Folkes, C.J.R. & Forster, P.I. (1995). Leaf Oils of the Genus *Backhousia* (Myrtaceae). *Journal of Essential Oil Research* 7: 237–254.

Cooper, W. & Cooper, W.T. (2004). *Fruits of the Australian Tropical Rainforest*. Nokomis Editions: Melbourne.

Craven, L.A. (1987). A taxonomic revision of *Calytrix* Labill. (Myrtaceae). *Brunonia* 10: 1–138.

Craven, L.A. & Biffin, E. (2005). *Anetholea anisata* transferred to, and two new Australian taxa of, *Syzygium* (Myrtaceae). *Blumea* 50: 157–162.

Doran, J.C., Brophy, J.J., Lassak, E.V. & House, A.P.N. (2001). *Backhousia citriodora* F.Muell. – Rediscovery and chemical characterization of the l-citronellal form and aspects of its breeding system. *Flavour & Fragrance Journal* 16: 325–328.

Guymer, G.P. (1988). A new species of *Backhousia* Hook. & Harvey (Myrtaceae) from Queensland and a reappraisal of *Backhousia floribunda* A.J.Scott. *Austrobaileya* 2: 567–569.

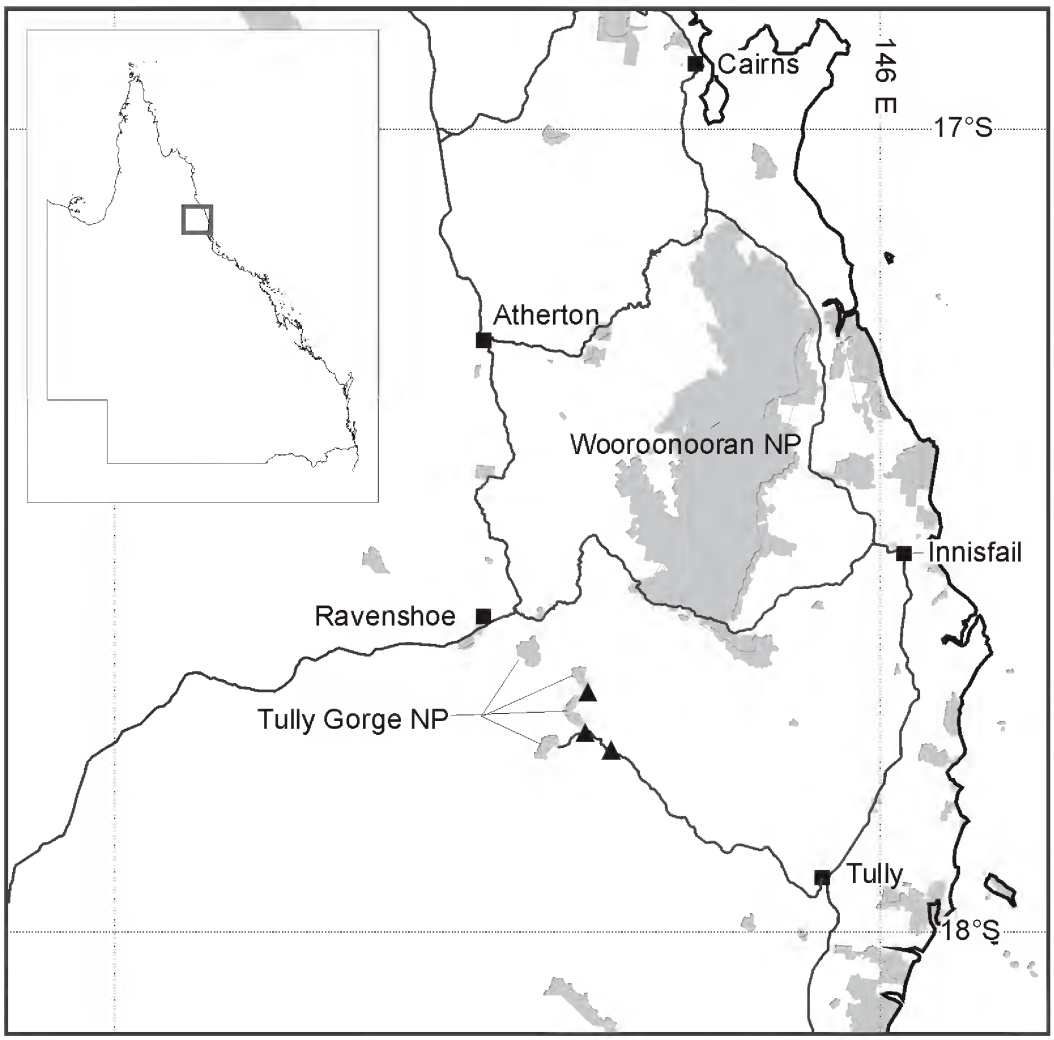
Iucn (2001). *IUCN Red List Categories and Criteria: Version 3.1*. IUCN: Gland & Cambridge. (url: http://www.iucn.org/themes/ssc/redlists/redlistcatsenglish.pdf).

Weberling, F. (1966). Additional notes on the Myrtaceous affinity of *Kania eugenioides* Schltr. *Kew Bulletin* 20: 517–520.

Weberling, F. (2000). *Tepualia stipularis* (Myrtaceae), una planta con appendices estipuliformes y estipulas rudimentarias. *Kurtziana* 28: 313–315.

Wilson, P.G., O'Brien, M.M. & Quinn, C.J. (2000). *Anetholea* (Myrtaceae), a new genus for *Backhousia anisata*: a cryptic member of the *Acmena* alliance. *Australian Systematic Botany* 13: 429–435.

Wilson, P.G., O'Brien, M.M., Gadek, P.A. & Quinn, C.J. (2001). Myrtaceae revisited: a reassessment of infrafamilial groups. *American Journal of Botany* 88: 2013–2025.



Map 1. Distribution of *Backhousia enata* ▲ in the 'Wet Tropics' of Queensland

Bazzania sauropoda D.Meagher (Marchantiophyta: Lepidoziaceae), a new species from tropical Queensland

David Meagher

Summary

Meagher, D. (2005). *Bazzania sauropoda* D.Meagher (Marchantiophyta: Lepidoziaceae), a new species from tropical Queensland. *Austrobaileya* 7(1): 129–133. *Bazzania sauropoda* sp. nov. (Marchantiophyta: Lepidoziaceae), a liverwort from tropical rainforest in north-eastern Queensland, is described, and its known distribution described.

Key Words: Lepidoziaceae, *Bazzania sauropoda*, bryophyte, liverwort, Marchantiophyta, Queensland flora

D. Meagher, School of Botany, The University of Melbourne, Victoria 3010, Australia

Introduction

The genus *Bazzania* S.F. Gray (Lepidoziaceae) comprises leafy liverworts with two rows of lateral leaves inserted incubously on the stem, a row of underleaves on the ventral side of the stem, and minutely leafy ventral flagella arising from the axils of underleaves. In almost all species the branches grow as strongly as the stem from which they arise, so that the branching is distinctly Y-shaped and resembles dichotomous branching. For this reason, such branching is called 'pseudodichotomous'. The branches are always of the *Frullania* type; that is, the branch replaces the ventral half of a lateral leaf, leaving the other half of the leaf in the branch junction on the dorsal side.

Numerous specimens of *Bazzania* have been collected in Queensland, but the names given to them have been largely incorrect. Many have been identified as *Bazzania involuta* (Mont.) Trev., but that species is confined to New Zealand and Tasmania (Meagher in press).

In Australia, the diversity of *Bazzania* species generally increases with decreasing latitude, culminating in a maximum diversity in the Wet Tropics World Heritage Area, where at least twenty species occur (Meagher 2003, 2005). Most of the species in northern Queensland are already known from New Guinea, Borneo, Java or other islands to the north, but some are undescribed, including the species now described here.

Accepted for publication 12 July 2005

Taxonomy

Bazzania sauropoda D.Meagher **sp. nov.** *Bazzania* foliis suboppositis, non vittatis, asymmetrice ovato-lingulatis, apicibus asymmetrice 3-dentatis sed aliter integris; amphigastriis incrassatis, praecipue profunde 3-lobatis sed plerumque cum lobis minoribus in lateribus; cellulis folii valde incrassatis et nodulosis, omnibus magnitudine similaribus; cellulis amphigastriorum similaribus sed minoribus; perianthio ubique quadricarinato.

Typus: Australia, Queensland. Cook District: summit of Mount Lewis, Sept 1986, *G.A.M. Scott s.n.* (holo: MELU261; iso: BRI, CANB, F).

Plants robust, dioecious, strongly anisophyllous, pendent. Branching pseudodichotomous, the branches of *Frullania*-type, spreading widely (usually > 90°); branch dorsal half-leaf ± symmetric, narrowly ovate, tapering to an acute, undivided (rarely bifid) apex; first branch underleaf 1-fid or nearly 2-fid, not connate with the adjacent stem underleaf although closely situated to it. Leaves subopposite, spreading widely when moist but folded strongly to the ventral side of the stem when dry, not vittate, asymmetrically ovate-lingulate, mostly 1.2–1.6 mm x 0.65–0.8 mm, with an arched dorsal margin and a straight to slightly incurved ventral margin; apex much narrower than the rest of the leaf, mostly 3-fid but sometimes obscurely so, rarely with an extra

lobe or two; apical teeth short and blunt, sinuses between lobes ranging from widely lunate to narrowly triangular. Cells in mid-leaf mostly 20–30(–40) x 20–25(–30) µm, slightly smaller near the margins, in more-or-less regular longitudinal rows, very thick-walled, strongly nodulose, with massive, confluent and bulging trigones. Oil bodies transparent, 2–5 per cell, very variable in shape, from globular to ellipsoid, spindle-shaped or almost oblong, undivided, slightly lumpy. Underleaves mostly 0.45–0.60 mm x 0.35–0.50 mm, connate with leaves on one side only, variable in shape but mostly deeply 3-fid, lobes often ending in a small apiculus; additional smaller lobes sometimes present. Cells of the underleaves as for the leaves but slightly smaller. Perianth about 2.5 mm long, almost sessile on a very short ventral branch, unevenly 4-keeled throughout its length, narrowing to a very shortly ciliate mouth; outermost bracts (bracteoles) with broad lobes, intermediate bracts deeply and narrowly lobed, innermost bracts ± laciniate; cells of intermediate and innermost bracts ± rectangular, thick-walled, most (except those in laciniae) with a strong central papilla. Flagella numerous, long and thin, sparsely to moderately leafy. **Fig. 1**.

***Additional specimens examined*: Queensland.** Cook District: Mount Lewis, Aug 1995, *Brown 95/358* (NSW); Platypus Creek, Jan 1936, *Flecker s.n.* (CANB); Lamb Range, Apr 2005, *Meagher 2101* (MELU); Mount Lewis, Feb 1983, *Streimann 29787, 29791* (CANB); Lamb Range, Jun 1984, *Streimann 29828* (CANB); Bellenden Ker, South Peak, Mar 1983, *Streimann 27348* (CANB); Mount Finnigan, Cedar Bay N.P., Oct 1995, *Streimann 57207, 57208, 57209, 57226, 57135* (CANB); Windsor Tableland, Jun 1984, *Streimann 29586* (CANB). North Kennedy District: Paluma Range, Cloudy Creek, Jun 2005, *Dalton s.n.* (MELU); Cardwell Range, Jun 1984, *Streimann 28625* (CANB).

***Distribution and habitat*:** *Bazzania sauropoda* is known only from montane tropical rainforest at seven locations in the Wet Tropics World Heritage Area (**Map 1**). It is usually an epiphyte on small trees, but one specimen was found growing on rock.

***Notes*:** Most species of *Bazzania* (and its partial synonym *Mastigobryum* Gott., Lindenb. & Nees) reported from the Australian tropics are well-known species that occur also in South East Asia and Melanesia (Meagher 2002, 2005; McCarthy 2003). Stephani (1908, 1924) described many species from the region and illustrated them all in his unpublished 'Icones'. Significant studies and reviews of the genus *Bazzania* have since been undertaken for South East Asia and Melanesia by Evans (1933), Grolle (1968, 1972), Herzog (1931, 1949, 1953), Kitigawa (1972, 1973, 1979, 1980), Meijer (1960) and Tixiér (1985), and for other nearby and distant regions of the world by Arnell (1963), Engel & Merrill (1994), Engel & Schuster (1988), Fulford (1963), Grolle & Schultze-Motel (1973), Hattori & Mizutani (1958), Hodgson (1954), Jones (1975), Long & Grolle (1990), Magill & Schelpe (1979), Mizutani (1967), Pócs (1969, 1994), Scott (1985), Smith (1990) and Wiggington & Grolle (1996). Among the hundreds of species reported and described by these authors, none resembles the present species.

In *Bazzania sauropoda* the leaves are much the same shape as some other species, but the shape of the underleaves is very distinctive and does not resemble that of any other species. Furthermore, certain microscopic characters such as nodulose cells of more-or-less uniform size throughout the leaves and underleaves, and massive bulging trigones, are very uncommon in *Bazzania*.

***Etymology*:** The specific epithet refers to the shape of the underleaves, which is reminiscent of the footprint of a large lizard.

Acknowledgements

Thanks to Dr John Engel (Field Museum, Chicago, USA) for correcting the description and for valuable comments on the manuscript; Andi Cairns (James Cook University) for organising permits to collect new material; the Queensland Environmental Protection Agency for permission to collect material on public land; Dr Peter Wilson (National Herbarium of New South Wales) for kindly correcting the Latin diagnosis; Dr Elizabeth Brown (National Herbarium of New South Wales) for important corrections and suggestions on the manuscript; and to the curators at the Australian National Botanic Gardens Herbarium in Canberra (CANB, CBG), the School of Botany Herbarium at The University of Melbourne (MELU, MUCV) and the National Herbarium of New South Wales (NSW) for loans of specimens.

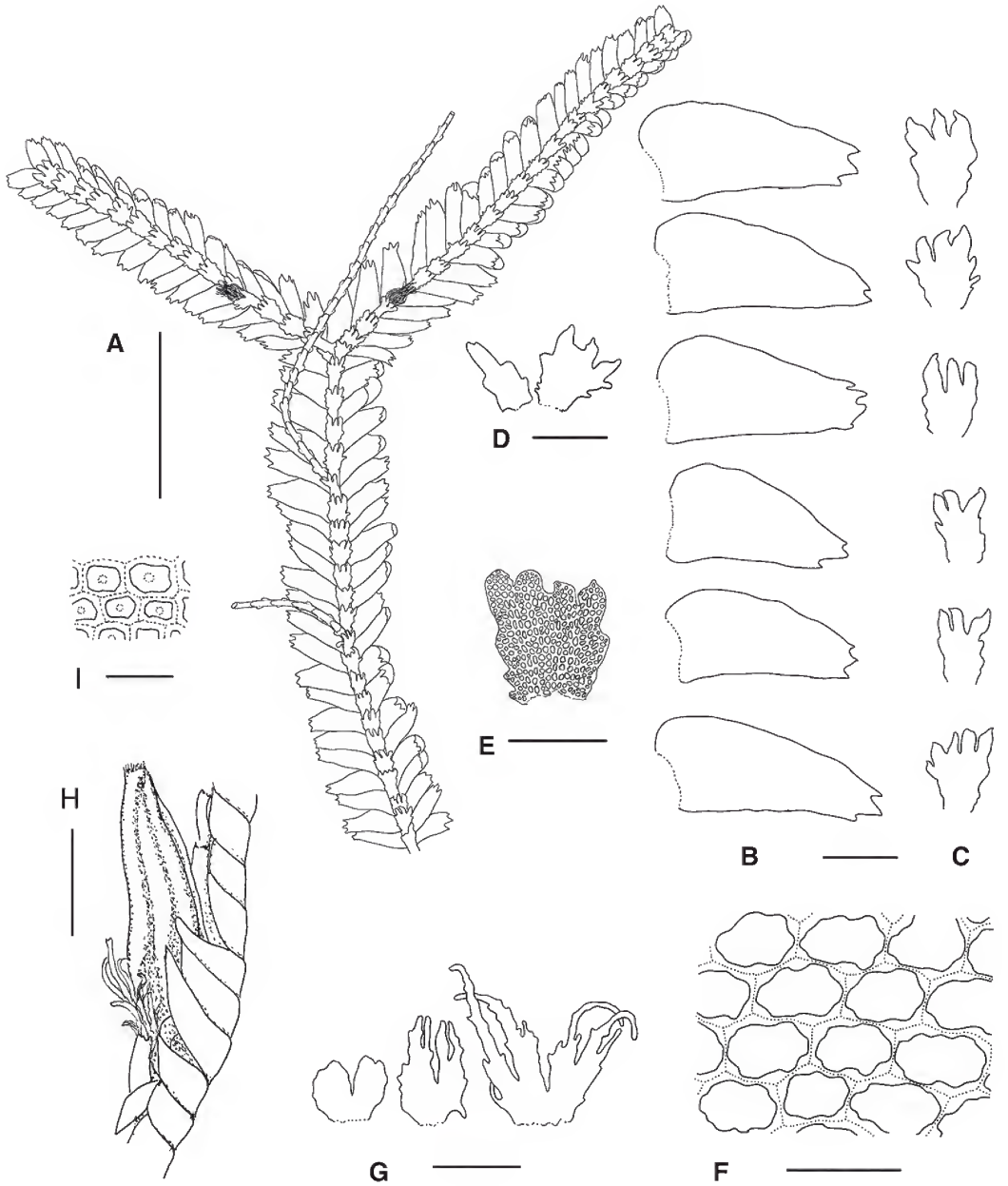
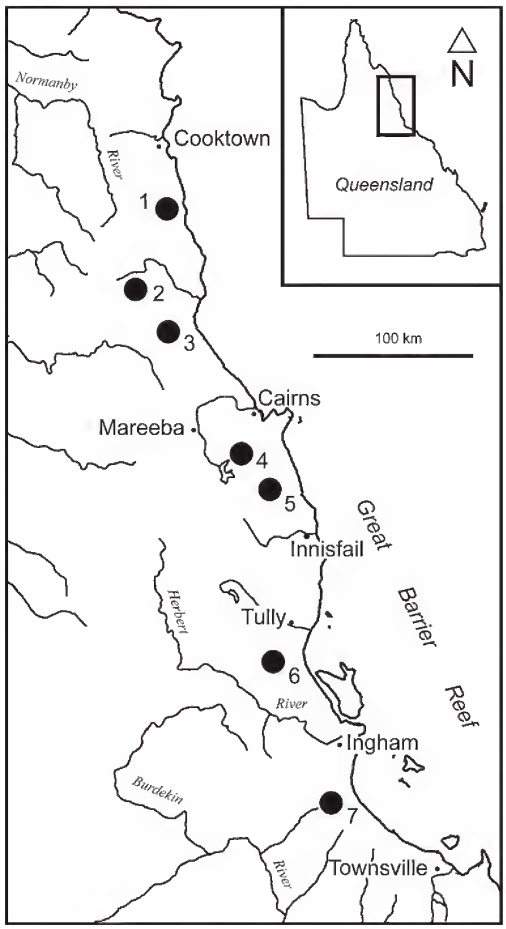


Fig. 1. ***Bazzania sauropoda.*** A. dorsal view of portion of moist plant with two young gynoecia. B. lateral leaves. C. underleaves. D. first branch underleaf and adjacent stem underleaf. E. underleaf. F. cells in centre of leaf. G. female bracts (left to right) outermost, intermediate, innermost. H. perianth (dry). I. cells of innermost bract. (Scale bars: A 5 mm, B–E, G–H 0.5 mm, F, I 0.05 mm, H 1 mm.).



Map 1. Distribution of *Bazzania sauropoda*. 1: Mount Finnigan. 2: Windsor Tableland. 3: Mount Lewis. 4: Lamb Range. 5: Bellenden Ker. 6: Cardwell Range. 7: Paluma Range.

References

ARNELL, S. (1963). *Hepaticae of South Africa*. Swedish Natural Science Research Council: Stockholm, Sweden.

ENEGL, J.J. & MERRILL, G.L.S. (1994). Studies of New Zealand Hepaticae. 8–13. *Bazzania* and *Acromastigum*. *The Bryologist* 97: 313–320.

Engel, J.J. & SCHUSTER, R.M. (1988). Studies of New Zealand Hepaticae. 1–6. *Brittonia* 40(2): 200–207.

EVANS, A.W. (1933) ['1932']. Some representative species of *Bazzania* from Sumatra. *Papers of the Michigan Academy of Science, Arts and Letters* 17: 69–118.

FULFORD, M.H. (1963) ['1962']. Manual of the leafy Hepaticae of Latin America—Part I. *Memoirs of the New York Botanical Gardens* 2: 1–172.

GROLLE, R. (1968). Lebermoose aus Neuguinea. 7. Vierte Fundliste. *Journal of the Hattori Botanical Laboratory* 31: 1–12.

GROLLE, R. (1972). *Bazzania* in Europa und Macronesien. Zur Taxonomie und Verbreitung. *Lindbergia* 1: 193–204.

GROLLE, R. & SHULTZE-MOTEL, W. (1973). Vorläufiges Verzeichnis der Lebermoose von Samoa. *Journal of the Hattori Botanical Laboratory* 36: 75–89.

HATTORI, S. & MIZUTANI, M. (1958). A revision of the Japanese species of the family Lepidoziaceae. *Journal of the Hattori Botanical Laboratory* 19: 76–118.

HERZOG, T. (1931). II. Hepaticae. In H. Winkler, Borneo-Pflanzen. *Mitteilungen aus den Institut für allgemeine Botanik in Hamburg* 7: 182–216.

HERZOG, T. (1949). Hepaticae Borneenses (Oxford University Expedition to Sarawak, 1932). *Transactions of the British Bryological Society* 1(3): 275–326.

HERZOG, T. (1953). Lebermoose aus Neukaledonien gesammelt von Dr. O.H. Selling. *Arkiv för Botanik* (ser. 2, band 3) 3: 43–61.

HODGSON, E.A. (1954). New Zealand Hepaticae (Liverworts)—VIII. A review of the New Zealand species of the genera *Bazzania* and *Acromastigum*. *Transactions of the Royal Society of New Zealand* 82(1): 7–24.

JONES, E.W. (1975). African Hepatics XXVII. *Bazzania*. *Journal of Bryology* 8: 71–75.

KITAGAWA, N. (1967). Studies on the Hepaticae of Thailand I. The genus *Bazzania*, with general introduction. *Journal of the Hattori Botanical Laboratory* 30: 248–270.

KITAGAWA, N. (1972). Notes on little-known species of Hepaticae, 1–25. *Journal of the Hattori Botanical Laboratory* 36: 444–454.

KITAGAWA, N. (1973). Miscellaneous notes on little-known species of Hepaticae, 26–50. *Journal of the Hattori Botanical Laboratory* 37: 263–273.

KITAGAWA, N. (1979). Studies on Asian species of *Bazzania*, Hepaticae, II. *Bulletin of the Nara University of Education* 28: 71–83.

KITAGAWA, N. (1980). New Guinean species of the genus *Bazzania*, I. *Journal of the Hattori Botanical Laboratory* 47: 127–143.

LONG, D.G. & GROLLE, R. (1990). Hepaticae of Bhutan. II. *Journal of the Hattori Botanical Laboratory* 68: 381–440.

MCCARTHY, P. (2003). *Catalogue of Australian Liverworts and Hornworts*. Australian Biological Resources Study: Canberra.

MAGILL, R.E. & SCHELPE, E.A (1979). The bryophytes of southern Africa. *Memoirs of the Botanical Society of South Africa* 43: 1–39.

MEAGHER, D. (2002). New bryophyte records for Australia. *Australasian Bryological Newsletter* 46: 6.

MEAGHER, D. (2005). New and interesting bryophyte records from New South Wales, Queensland and Victoria. *Australasian Bryological Newsletter* 50: 6–9.

MEAGHER, D. (in press). Studies on Victorian bryophytes 2. The genus *Bazzania* S.F. Gray. *The Victorian Naturalist* 122.

MEIJER, W. (1960). Note on the species of *Bazzania* (Hepaticae) mainly of Java. *Blumea* 10: 366–367.

MIZUTANI, M. (1967). Studies of the Himalayan species of *Bazzania*. *Journal of the Hattori Botanical Laboratory* 30: 71–90.

PÓCS, T. (1969). A short survey of the *Bazzania* of North Viet-Nam. *Journal of the Hattori Botanical Laboratory* 32: 79–94.

PÓCS,, T. (1994). Taxonomic results of the BRYOTROP expedition to Zaire and Rwanda. 27. Lepidoziaceae, II. *Tropical Bryology* 9: 123–130.

SCOTT, G.A.M. (1985). *Southern Australian Liverworts*. Flora and Fauna Bulletin 2. AGPS: Canberra.

SMITH, A.J.E. (1990). *The Liverworts of Britain and Ireland*. Cambridge University Press: Cambridge, UK.

SPRUCE, R. (1884). Hepaticae Amazonicae et Andinae. *Transactions and Proceedings of the Botanical Society, Edinburgh* 15: 366–381.

STEPHANI, F. (1908). *Species Hepaticarum*, Vol. 3. George et Cie: Genèva & Bâle.

STEPHANI, F. (1924). *Species Hepaticarum*, Vol. 6. Université de Genèva: Genèva.

TIXIER, P. (1985). A propos du genre *Bazzania* en Nouvelle-Calédonie. Récoltes de H.S. MacKee. *Cryptogamie, Bryologie-Lichénologie* 6: 177–180.

WIGGINTON, M.J. & GROLLE, R. (1996). Catalogue of the Hepaticae and Anthocerotae of Sub-Saharan Africa. *Bryophytorum Bibliotheca* 50: 1–267.

Gyrostemon osmus Halford (Gyrostemonaceae), a new species from south-eastern Queensland

D.A. Halford

Summary

Halford, D.A. (2005). *Gyrostemon osmus* Halford (Gyrostemonaceae), a new species from south-eastern Queensland. *Austrobaileya* 7(1): 135–139. *Gyrostemon osmus* Halford is described, illustrated and diagnosed against related species. Notes on habitat and distribution are provided. A new section, *G.* sect. *Monoecia* Halford is proposed to accommodate the new species.

Key Words: Gyrostemonaceae, *Gyrostemon*, *Gyrostemon osmus*, *Gyrostemon* section *Monoecia*, Queensland, Australian flora

D.A. Halford, c/- Queensland Herbarium, Environmental Protection Agency, Brisbane Botanic Gardens, Mt Coot-tha Road, Toowong, Queensland 4066, Australia

Introduction

Gyrostemon Desf. is a genus of dioecious shrubs and small trees distributed throughout southern and arid Australia. In George's (1982) *Flora of Australia* treatment of the genus, he recognised a total of twelve species, eight of which are endemic in Western Australia. Until now two species *G. ramulosus* Desf. and *G. tepperi* (F.Muell. ex H Walter) A.S.George were recorded for Queensland, from the far west of the State.

The species described here as *G. osmus* was first brought to my attention in May 2004 when a specimen was sent to the Queensland Herbarium for identification. The specimen was initially misidentified as *Codonocarpus attenuatus* (Hook.) H.Walter. The habit and broad flat leaf lamina of *G. osmus* gives this species a superficial resemblance to *Codonocarpus attenuatus*. However, *G. osmus* has fruiting carpels that dehisce along the midline of the dorsal surface, a character that distinguishes the genus *Gyrostemon* from *Codonocarpus* which has fruiting carpels that dehisce along the ventral surface.

Taxonomy

Gyrostemon osmus Halford, **sp. nov.** ut videtur maxime arcte affinis *G. racimigero* autem planta monoecia foliis grandioribus 6–20 × 0.7–3 cm (vice 1–5 × c. 0.2 cm) praedita, floribus maribus 13–15 staminibus in verticillum unum dispositis (vice 45–50 staminibus in 4–5 series dispositis), floribus femineis in pedicellis 2–3 mm longis (comparitis ad flores femineos in pedicellis 2–3 mm longis), stigmatibus 2.5 mm longis, ± linearibus (vice 1–1.5 mm longis aliquantum petaloideis) differt. **Typus:** Queensland. Moreton District: Pages Pinnacle, *c.* 10 km WSW of Mudgeeraba, 11 January 2005, *D. Halford Q8348* (holo: BRI; iso: AD, DNA, MEL, MO, NSW, PERTH *distribuendi*).

Monoecious, short-lived perennial subshrub to 2.5 m high, single-stemmed or much branched near ground. Branches hollow, stout, ± terete, stiffly erect with few lateral branchlets, glabrous, sparsely papillose when young becoming smooth with age, green to yellowish orange becoming orange to reddish orange in colour with age, no cork development. Stipules triangular, 0.2–0.7 mm long, acute. Leaves ± sessile, spirally alternate, spreading, discolorous; lamina flat, thin, lanceolate or very narrowly elliptic-ovate, 6–20 cm long, 0.7–3 cm wide, glabrous and smooth except for scattered protuberances on margins and along mid and lateral veins; base cuneate; apex attenuate; midvein slightly raised on adaxial surface, prominent on abaxial surface; lateral veins widely spaced, *c.* 70° to midvein. Inflorescences racemose, axillary, with 1–20 female flowers basal on the axis and 1–60 males flowers distal

Accepted for publication 18 July 2005

to them; axis 0.8 to 10 cm long, papillose; bracts linear-lanceolate 1.5–3.5 mm long, pale brown. Male flowers on pedicels 1–2.7 mm long; calyx cupular, *c.* 2 mm across, green, divided to *c.* 1/3 into 7 or 8 lobes; lobes broadly triangular, acute at apex; stamens 12–15 in 1 whorl; filaments to 0.2 mm long, stout; anthers ± obloid-clavate, 1.8–2.2 mm long, rounded to retuse at apex, 2-locular, dehiscing by lateral longitudinal slits; rudimentary carpels present around central disc; disc *c.* 0.8 mm diameter, flat or slightly convex, ± smooth. Female flowers sessile or shortly pedicellate; pedicels to 0.6 mm long; calyx persistent, cupular, *c.* 1.5 mm across, green, divided $^1/_3$ to ½ into 5–8 lobes; lobes ± triangular, obtuse to acute at apex; androecium obsolete; carpels 10–12, free, attached around central column; ovule 1 per carpel, attached near centre of column; stigmas as many as carpels, spreading at anthesis, marcescent, shortly connate at base, ± linear, 2.5–4 mm long, ± tetragonous in transverse section, glabrous, longitudinally sulcate on adaxial surface, tuberculate on abaxial surface; central column expanded at top into disc; disc 0.4–0.5 mm across, tuberculate. Fruits depressed globose, 3–5 mm long, 6–9 mm across; fruiting carpels laterally compressed, reniform, scarious, ± inflated, ± smooth and rounded on dorsal surface, dehiscing along longitudinal midline of dorsal surface into 2 segments which readily separate from the persistent central column. Seeds ± comma-shaped in lateral view, 1.7–2 mm long, dark brown, transversely rugose; aril white, enclosing base of seed. **Fig. 1 & 2**.

Additional specimens examined: **Queensland.** Moreton District: Pages Pinnacle, May 2004, *Halford Q8232* (BRI); Pages Pinnacle, *c.* 100 m SE of summit, 9.5 km WSW of Mudgeeraba, Apr 2004, *O'Donnell 1* (BRI).

***Distribution and habitat*:** *Gyrostemon osmus* is endemic in south-eastern Queensland, where it is currently known from the type locality on Pages Pinnacle west of Mudgeeraba. It grows in a tall open heath on narrow ledges and steep slopes of a razorback ridge on shallow well-drained greyish loam soils derived from rhyolite. Associated plants include *Allocasuarina littoralis*, *Leptospermum microcarpum*, *Lepidosperma laterale*, *Xanthorrhoea latifolia* subsp. *latifolia*, *Dendrobium kingianum* and *Platysace lanceolata.*

***Phenology*:** Flowers have been recorded from January, April and May.

***Affinities*:** In George's (1982) keys to the species of *Gyrostemon*, *G. osmus* will key to *G. tepperi* in the key based on male plants and to *G. racemiger* in the key based on female plants. A comparison of diagnostic differences between *G. osmus*, *G. tepperi* and *G. racemiger* is provided in **Table 1**.

Gyrostemon osmus is unique within *Gyrostemon* and is easily distinguished from all other species by the following combination of characters: plants monoecious; leaf lamina flat and thin, 0.7–3 cm wide; flowers in axillary racemes; 12–15 stamens in single whorl; female flowers sessile or with pedicel to 0.6 mm long; 10–12 carpels per flower; fruits depressed globose with fruiting carpels not thickened along midline of dorsal surface; stems without corky bark.

Some may consider these morphological differences sufficient to warrant the recognition of a new genus. However, I feel it would be premature to do so in the absence of more complete knowledge of the variation within the genus. George (2003) indicates that there are several inadequately known taxa of *Gyrostemon* in Western Australia.

Keighery (1985) recognised two sections within *Gyrostemon* namely, *G.* sect. *Gyrostemon* and *G.* sect. *Didymotheca* (Hook.f) Keighery. These sections were based on the number of staminal whorls and number of carpels. *Gyrostemon osmus* does not fit into either of the sections as circumscribed by Keighery. The attributes of a single whorl of stamens and 10–12 carpels, together with plants monoecious, and leaf laminae thin and flat, warrant the segregation of *G. osmus* to a new section within *Gyrostemon*. I here describe *Gyrostemon* sect. *Monoecia* to accommodate *G. osmus*. The differences between the three sections of *Gyrostemon* are set out in **Table 2**.

Gyrostemon sect. **Monoecia** Halford **sectio nova.** A *Gyrostemone* sect. *Gyrostemone* et *G.* sect. *Didymotheca* differt plantis monoeciis, foliis teneris plus minusve planis (in illis plantae dioeciae, foliis crassis pro parte maxima filiformibus usque teretibus) etiam a sect. *Gyrostemone* verticillo unico staminum (in illo

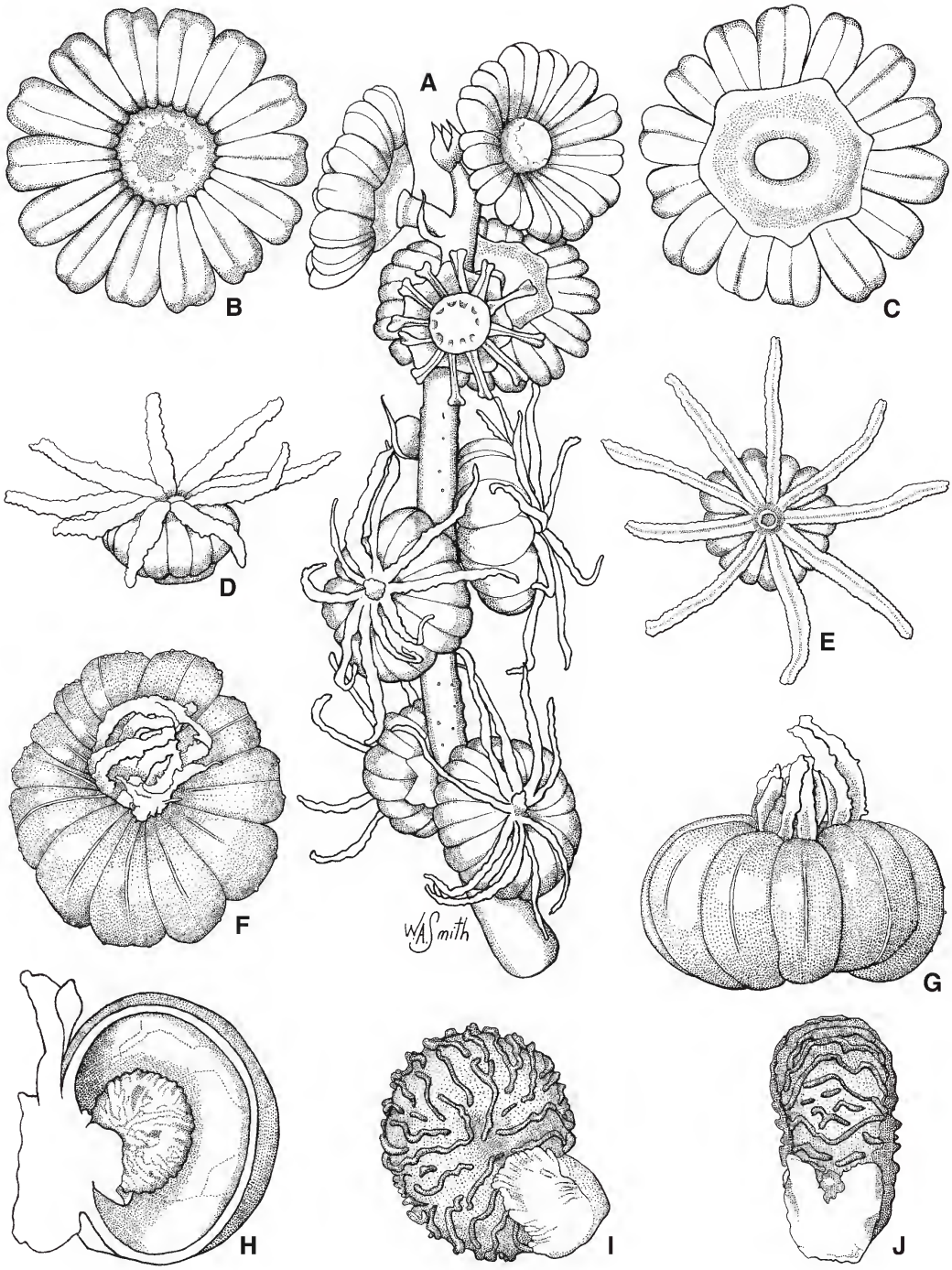


Fig. 1. ***Gyrostemon osmus.*** A. inflorescence with male and female flowers ×6. B. male flower viewed from above ×8. C. male flower viewed from below ×8. D. female flower viewed from side ×8. E. female flower viewed from above ×8. F. fruit viewed from above ×6. G. lateral view of fruit ×6. H. lateral cross section of fruit showing seed attachment ×10. I. lateral view of seed ×16. J. ventral view of seed ×16. All from *Halford Q8232* (BRI). Del. W. Smith.

Table 1. Morphological comparison of *Gyrostemon osmus*, *G. tepperi* and *G. racemiger*.

Character	*G. osmus*	*G. tepperi*	*G. racemiger*
breeding system	monoecious	dioecious	dioecious
leaf lamina shape	flat, lanceolate or very narrowly elliptic ovate	linear-terete	linear-terete
leaf lamina dimensions	6-20 × 0.7-3 cm	0.5-3 × c. 0.1 cm	1-5 × c. 0.2 cm
male flowers per raceme	up to 50	1-3	up to 14
no. of staminal whorls	1	1	4-5
stamen number	12-15	7-10	45-60
female flowers per raceme	up to 20	solitary or up to 3	up to 8
female flower pedicel length	obsolete or up to 0.6 mm	1-2 mm	2-3 mm
carpel number	10-12	1 or 2	10-18 or more
stigma length	2.5-4 mm	*c.* 1 mm	1-1.5 mm
stigma shape	± linear	petaloid	± petaloid
aril	enclosing base of seed	almost enclosing whole seed	enclosing up to ½ of the seed

duobus usque aliquot) et a sect. *Didymotheca* carpellis 10–12 (in illo 1–4) differt. **Typus**: *G. osmus* Halford.

***Conservation status*:** *Gyrostemon osmus* is currently known only from the type locality. Pages Pinnacle is not within a conservation reserve; however, it is in an area set aside as part of the Water Catchment area for the Hinze Dam. The population has been observed to fluctuate dramatically with as few as 5 individuals in August 2004 to approximately 1000 plants in January 2005. The increase in population size was in response to a fire that burnt through the habitat in October 2004. Preliminary field observations indicate *G. osmus* has a soil-stored seedbank, the germination of which appears to be induced by fire.

This species fulfils the criteria of "Critically Endangered" under the IUCN (2001) categories (CR B1ac(iv); B2ac(iv)). Further searches of likely habitat are required in south-eastern Queensland and northern New South Wales.

***Etymology*:** The specific epithet is derived from the Greek *osme* meaning 'odor, smell'; in reference to the faint pungent odor which emanates from the plant when crushed.

Acknowledgements

I am grateful to Will Smith for the excellent illustration, Peter Bostock for the photograph used in Fig. 2 and the translation of the diagnosis of *G.* sect. *Monoecia* into Latin, Les Pedley for the translation of the diagnosis of *G. osmus* into Latin and Gordon Guymer, Director of BRI, for

Table 2. Morphological comparison of *Gyrostemon* sect. *Gyrostemon*, *G.* sect. *Didymotheca* and *G.* sect. *Monoecia*

Character	*G.* sect. *Gyrostemon*	*G.* sect. *Didymotheca*	*G.* sect. *Monoecia*
breeding system	dioecious	dioecious	monoecious
leaf texture	thick	thick	thin
leaf shape	filiform to linear-terete	narrowly lanceolate, narrowly obovate, linear to linear-terete	lanceolate or very narrowly elliptic-ovate
Number of staminal whorls	2-numerous	1	1
Number of stamens	11-100	7-14	12-15
Number of carpels	2-30	1-4	10-12

assistance in the field and for making available working space and facilities at BRI. An anonymous referee is thanked for useful comments.

References

George, A.S. (1982). *Gyrostemonaceae. Flora of Australia* 8: 362–378. Australian Biological Resources Study/CSIRO Publishing: Melbourne.

George, A.S. (2003). *Gyrostemonaceae*. In Kubitzki (ed.), *The Families and Genera of Vascular Plants* 5: 213–217. Springer-Verlag: Berlin, Heidelberg.

Iucn (2001). *IUCN Red List Categories: version 3.1*. IUCN Species Survival Commission. IUCN: Gland, Switzerland.

Keighery, G.J. (1985). *Walteranthus*, a new genus of Gyrostemonaceae from Western Australia. *Botanische Jahrbücher für Systematik Pflanzengeschichte und Pflanzengeographie* 106: 107–113.

Fig. 2. *Gyrostemon osmus*. Branchlet with flowers and fruit. Photo: P.D. Bostock.

Eucalyptus erosa A.R.Bean (Myrtaceae), a new stringybark species from central Queensland

A.R. Bean

Summary

Bean, A.R. (2005). *Eucalyptus erosa* A.R.Bean (Myrtaceae), a new Stringybark species from central Queensland. *Austrobaileya* 7(1): 141–144. *Eucalyptus erosa*, a new species of the stringybark group (*E.* ser. *Pachyphloius* Blakely) is described, illustrated and diagnosed against closely related species.

Key Words: Myrtaceae, stringybark, eucalypt taxonomy, *Eucalyptus erosa,* Queensland flora.

A.R. Bean, Queensland Herbarium, Environmental Protection Agency, Brisbane Botanic Gardens Mt Coot-tha, Mt Coot-tha road, Toowong, Queensland, 4066, Australia.

Introduction

Eucalyptus series *Pachyphloius* Blakely comprises taxa commonly known as the 'true stringybarks' (Ladiges and Humphries 1986). They are characterised by the thick longitudinally fibrous bark persistent throughout the trunk and most or all branches, and the seedlings with emergent oil glands bearing numerous radiating hairs, in appearance like stellate hairs. Frequently they exhibit sessile buds and fruits, and oblique adult leaf bases. Chippendale (1988) enumerated 21 species for the group while Brooker (2000) listed 28 species. The majority of these species occur in eastern New South Wales and eastern Victoria, but several species extend to Queensland, mostly in higher altitude areas along the southern parts of the Great Dividing Range in the south-east.

On the high ranges and plateaux between Injune and Springsure, including the Consuelo Tableland, two species of *E.* series *Pachyphloius* are indigenous. One is *E. laevopinea* R.T.Baker, which also grows widely on the New England Tableland much further south. On the Consuelo Tableland, it forms a superb tall forest, "the best natural stringybark forest in existence" (I. Brooker pers. comm.). The second species (described here) is most closely related to *E. mackieana*. It grows on deep sandy soils derived from the weathering of quartzose sandstone rock, and is also a tree of impressive proportions.

Accepted for publication 30 June 2005

Taxonomy

Eucalyptus erosa A.R.Bean **sp. nov.** affinis *E. mackieanae* sed plantulae foliis latioribus densius hirsutis, pedicellis longioribus, fructus disco plano et cotyledonibus latioribus differens. **Typus:** Queensland. Maranoa District: 13 km N of Mt Moffatt Homestead, on road to Consuelo Tableland, 27 April 1981, *D.F. Blaxell 1883 & L.A.S. Johnson* (holo: BRI; iso: CANB, MEL, NSW).

Eucalyptus sp. (Carnarvon Range) in Ladiges & Humphries (1986), Neish *et al.* (1995)

Eucalyptus sp. (Mt Moffatt HS D.F. Blaxell+ 1883) in Bean *et al.* (2002)

Well-formed tree to 30 metres high, lignotuberous, trunk straight. Bark persistent except on small branches, coarsely fibrous to stringy, grey on outside, brown underneath. Juvenile leaves sub-opposite to alternate, lanceolate to narrowly-ovate, 5–7 × 1.5–2 cm, strongly discolorous, apex acute, base cuneate to obtuse, margins minutely denticulate, petioles 0.2–0.3 cm long; stems, petioles and leaves covered with clusters of simple radiating hairs, in appearance like stellate hairs, each cluster 0.3–0.5 mm diameter. Intermediate leaves broadly lanceolate, 7.5–9.5 × 2.5–3.5 cm, glabrous, slightly discolorous, apex apiculate, base oblique. Adult leaves falcate or lanceolate, 7–14 × 1.1–2.3 cm, alternate, concolorous, penninerved, lateral veins at 30–45° to the

midrib; reticulation very sparse, with numerous large island oil glands, several per areole; intramarginal vein present, 0.5–1.3 mm from the margin; apex acute, mucronate or uncinate, base cuneate to oblique, margins erose due to marginal glands (4–9 on each side of lamina); petioles 10–16 mm long. Inflorescences axillary, unbranched, 9–11(–13) flowered umbellasters; peduncles angular to flattened, 7–14 mm long; pedicels 2–4.5 mm long; immature buds ellipsoidal; mature buds obovoid, 5.5–7 mm long, 3.5–4 mm in diameter, smooth and without ridges. Hypanthium obconical, 3.5–4 mm long; operculum conical to apiculate, 2–4 mm long, scar absent; stamens white, irregularly flexed, all fertile. Anthers reniform to cordate, versatile, anther slits confluent. Style terete, stigma blunt or tapered. Ovary 3–4-locular, ovules in 2 vertical rows. Fruits cupular to hemispherical, 4–6 mm long, 6–7.5 mm in diameter, disc flat, 0.8–1.4 mm wide, valves 3–4, at rim level, pedicels 2.5–5 mm long. Seeds pyramidal to D-shaped, 1.6–2.0 mm long, not toothed, dark brown, surface faintly reticulate, hilum terminal. Chaff similar in size and shape, but paler. **Fig. 1**.

***Additional specimens examined*: Queensland**. MARANOA DISTRICT: 146 km NW of Injune on road to Consuelo Tableland, Sep 1977, *Blaxell 1529 & Armstrong* (BRI, NSW); 155 km NW of Injune on road to Consuelo Tableland, Sep 1977, *Blaxell 1524 & Armstrong* (BRI, NSW); between Warrong and Mt Moffatt, NW of Injune, Apr 1975, *Brooker B4867, B4868* (BRI, CANB); Great Dividing Range, c. 80 km SW of Rolleston, Kenniff Caves, Jun 1977, *Crisp 3068* (BRI, CANB, NSW); 6 km W of Mt Moffatt HS, May 1982, *Neldner & Thomas 749* (BRI). WARREGO DISTRICT: c. 0.5 km N of Pumphole Spring, Dooloogarah Creek, Feb 1977, *Martensz 1148, 1149 & Johnston* (BRI, CANB).

***Distribution and habitat*:** *Eucalyptus erosa* is confined to the Mt Moffatt section of Carnarvon National Park, north-west of Injune, and the adjacent grazing property "Dooloogarah". It grows on coarse sandy colluvials derived from outcropping quartzose sandstone, at altitudes of 700–900 metres. It occurs in association with *Angophora leiocarpa* (G.J.Leach) K.R.Thiele & Ladiges, *Eucalyptus grisea* L.A.S.Johnson & K.D.Hill and *Callitris glaucophylla* Joy Thomps. & L.A.S.Johnson.

***Phenology*:** Flowers have been recorded for May. Fruits may be found throughout the year.

***Notes*:** The most remarkable feature of *E. erosa* is the consistent and conspicuous presence of marginal glands on the adult leaves. On the newly emerging leaves (new growth), they are readily observed as pustular glands crowded towards the distal end of the leaf (**Fig. 1d**). On fully grown leaves, they are more or less evenly distributed along the margins (**Fig. 1c**). By this stage, the glands have usually erupted from the surface along the margin, leaving a slightly sunken, elliptical structure, that is then more appropriately called a leaf-margin lenticel (Neish *et al.* 1995). In this species and a few others (e.g. *E. denticulata*), the leaf-margin lenticels are associated with irregularities in the leaf margin that are conspicuous to the naked eye. In other species, the leaf margin irregularities are much more subtle.

"Irregular leaf margins" was one of the characters used by Ladiges & Humphries (1986) in their cladistic analysis of the stringybark group. They noted its presence in *E. erosa* (as *E.* sp. Carnarvon Range), but not for any other member of the Stringybark group. Neish *et al.* (1995) documented the occurrence of this character in five species of *Eucalyptus*, including one additional species of stringybark, *E. laevopinea*. However, this character is much more widespread in the genus than has yet been reported (Bean, unpubl. obs.).

E. erosa differs from the closely related *E. mackieana* by its juvenile leaves 1.5–2 cm wide (0.5-1 cm wide for *E. mackieana*), the seedling leaves with more than 30 hair clusters per square centimetre (vs. <12 for *E. mackieana*), the pedicels 2.5–5 mm long in fruit (1–2.5 mm long in *E. mackieana*), and fruits with a flat disc (convex disc in *E. mackieana*). According to Ladiges & Humphreys (1986), *E. erosa* has cotyledons 10–13 mm wide, compared to 5–7 mm wide for *E. mackieana*.

E. mackieana has long been spelt *E. mckieana*, but Recommendation 60C.4 of the IUCN (Greuter *et al.* 2000), stated that "The scottish patronymic prefix Mac, Mc or M', meaning "son of", should be spelled 'mac' and united with the rest of the name".

***Conservation status*:** There are no appreciable threats to this species. Under the IUCN criteria (IUCN 2001), *E. erosa* classifies as 'Least

Fig. 1. ***Eucalyptus erosa.*** A. juvenile leaves ×0.5. B. branchlet bearing axillary bud clusters ×0.5. C. adult leaf showing the marginal glands ×1. D. newly emerging adult leaves with pustular marginal glands ×4. E. umbellaster of mature buds (some buds have been shed) ×3. F. umbellaster of mature fruits (some fruits have been shed) ×3. G. mature fruit, viewed from above ×3. A,C from *Blaxell 1883 & Johnson*; B,D from *Crisp 3068*; E from *Neldner & Thomas 749*; F,G from *Martensz 1149 & Johnston* (all BRI). Del. W. Smith.

Concern'. Hence no conservation status is recommended.

***Etymology*:** The specific epithet is derived from the Latin *erosus*, referring to the erose (corroded, irregularly toothed, or apparently gnawed) margins of the adult leaves in this species.

Acknowledgements

I am grateful to Will Smith for the illustrations and Peter Bostock for the Latin diagnosis.

References

Bean, A.R., Guymer, G.P. & Jessup, L.W. (2002). Myrtaceae. In R.J.F. Henderson (ed.), *Names and Distribution of Queensland Plants, Algae and Lichens,* pp. 119–32. Environmental Protection Agency: Brisbane.

Brooker, M.I.H. (2000). A new classification of the genus *Eucalyptus* L'Hér. (Myrtaceae). *Australian Systematic Botany* 13: 79–148.

Chippendale, G.M. (1988). *Eucalyptus, Angophora* (Myrtaceae), *Flora of Australia* Vol. 19: 142–55. Australian Government Publishing Service: Canberra.

Greuter, W., McNeill, J., Barrie, F.R., Burdet, H.M., Demoulin, V., Filgueiras, T.S., Nicholson, D.H., Silva, P.C., Skog, J.E., Trehane, P., Turland, N.J. & Hawksworth, P.L. (2000). International Code of Botanical Nomenclature (Saint Louis Code). *Regnum Vegetabile*, Volume 138. International Association for Plant Taxonomy (Europe).

Iucn (2001). *IUCN Red List Categories and Criteria: Version 3.1*. IUCN Species survival Commission. IUCN: Gland, Switzerland/ Cambridge, UK.

Ladiges, P.Y. & Humphries, C.J. (1986). Relationships in the stringybarks, *Eucalyptus* L'Herit. informal subgenus *Monocalyptus* series *Capitellatae* and *Olsenianae*: phylogenetic hypotheses, biogeography and classification. *Australian Journal of Botany* 34: 603–632.

Neish, P.G., Drinnan, A.N. & Ladiges, P.Y. (1995). Anatomy of leaf-margin lenticels in *Eucalyptus denticulata* and three other eucalypts. *Australian Journal of Botany* 43: 211–221.

Rediscovery and neotypification of *Marsdenia arachnoidea* Schltr. (Apocynaceae: *Asclepiadoideae - Marsdenieae*), an endangered species from Papua New Guinea

Paul I. Forster[1] & Wayne Takeuchi[2]

Summary

Forster, P.I. & Takeuchi, W. (2005). Rediscovery and neotypification of *Marsdenia arachnoidea* Schltr. (Apocynaceae: *Asclepiadoideae - Marsdenieae*), an endangered species from Papua New Guinea. *Austrobaileya* 7(1): 145–150. The rediscovery of the long-lost *Marsdenia arachnoidea* Schltr. is reported. A neotype is selected for the name *M. arachnoidea* and the species is described and illustrated. It is endemic to Morobe Province of north-eastern Papua New Guinea, where the only known populations are under threat from habitat alteration.

Key Words: Asclepiadaceae, Apocynaceae, *Marsdenia arachnoidea,* taxonomy, rediscovery, conservation, New Guinea flora

[1]P.I. Forster, Queensland Herbarium, Environmental Protection Agency, Brisbane Botanic Gardens, Mt Coot-tha Road, Toowong, Queensland 4066, Australia. Email: paul.forster@epa.qld.gov.au

[2]W. Takeuchi, Herbaria and Arnold Arboretum of Harvard University, c/o National Forest Authority Planning Division and the PNG Forest Research Institute, P.O. Box 314, Lae, Morobe Province 411, Papua New Guinea.

Introduction

The genus *Marsdenia* R.Br. was recently revised by Forster (1995) for Australia and Papuasia (i.e. New Guinea, the Bismarck Archipelago, and the Solomon Islands). Including the single species described two years later (Forster 1997) there are currently 79 species recognized for the region.

Several species from New Guinea were not fully treated in Forster (1995) due to the destruction of type specimens at the Berlin-Dahlem Herbarium (B) in World War II, and the absence of conspecific collections referable to the lost types. Among these incompletely treated species was the distinctive *M. arachnoidea* Schltr. from north-eastern Papua New Guinea (PNG).

Marsdenia arachnoidea is distinguished by its long, filiform calyces, and by the unusual corona lobes with a retuse apex and basally involuted margins. Although the original collections were lost long ago, *M. arachnoidea* was fortuitously among the few species illustrated by Schlechter (1913). In the absence of authentically named specimens, Schlechter's illustration was previously the most effective means for identifying the species. With the recent rediscovery of this plant, a more comprehensive description of *M. arachnoidea* can now be presented. In the following account the new gatherings are illustrated and the conservation status of extant populations is also summarized.

Accepted for publication 11 July 2005

Taxonomy

Marsdenia arachnoidea Schltr., *Bot. Jahrb. Syst.* 50: 151 (1913).

Type Citation: "Nordöstl. Neu-Guinea: kleinere liane in den wäldern oberhalb Dschischungari, im Wariagebiet, ca. 1000 m ü M. (Schlechter n. 19845. – blühend im Juni 1909)"

Type: Papua New Guinea. Morobe Province: Lae, hills near Taraka, 6° 37'S, 146° 55'E, 25 October 2003, *W. Takeuchi & D. Ama* 16667 (neo [here designated]: BRI; isoneo: A, LAE).

***Illustration*:** Schlechter (1913: 151, fig. 10).

Wiry vine, prostrate or scandent, herbaceous, latex clear. Roots not seen. Indumentum of pale yellow-brown trichomes on most parts. Stems twining, cylindrical, up to 2 mm diameter, laxly provided with trichomes when young, usually

corky with age; internodes up to 14 cm long. Leaves petiolate; lamina lanceolate or oblong-lanceolate, up to 16 cm long and 5 cm wide, chartaceous, discolorous, upper surface dark green, glabrous except for scattered trichomes on midribs, lower surface pale green, trichomes short and sparse, denser on veins; colleters 8-10 at lamina base, conical, pale brown; venation brochidodromous, areolate in 1(–2) series near the margin, laterals 9–10 pairs, closing by supramedial loops, bifacially prominent, interlateral nervation reticulate, obscure above, raised below; petiole 20–40 mm long, *c.* 0.8 mm diameter, adaxially grooved, purple, trichomes dense. Cymes racemiform, up to 10 mm long; peduncles up to 8 mm long and *c.* 2 mm diameter, trichomes scattered; bracts filiform-lanceolate, up to 5 mm long, purple, with dense trichomes to 0.7 mm long. Flowers 13–15 mm long, 50–55 mm diameter; pedicels *c.* 7 mm long and 1 mm diameter, reddish-purple, with sparse, erect trichomes to 0.5 mm long. Sepals filiform-lanceolate, 18–19 mm long, *c.* 3.5 mm wide at base and *c.* 0.5 mm wide at tip, reddish-purple, with dense, erect trichomes to 0.5 mm long; colleters two at each sinus base. Corolla subrotate, reddish-purple and partly off-white in the tube, glossy; tube flattened, *c.* 7 mm long and 13 mm diameter, glabrous, with a raised mound under each corona lobe, not pouched at top; lobes filiform-lanceolate, fleshy, 24–25 mm long, *c.* 9 mm wide at base and 0.5 mm wide at tip, ciliate, otherwise glabrous; corolline corona absent. Staminal corona *c.* 7 mm long, 13–14 mm diameter, cream, lobes not in close proximity to one another, not overtopping style-head; each lobe *c.* 7 mm long, somewhat involuted or pouched at sides near the base, basal portion roughly rectangular, *c.* 3 mm wide at base, upper portion spathulate with a slightly retuse apex, *c.* 1 mm wide at tip. Staminal column 5–5.5 mm long, *c.* 4.5 mm diameter; anther appendages pandurate, *c.* 1 mm long and 1.5 mm wide; alar fissure *c.* 3 mm long. Style-head depressed-globose, *c.* 3 mm long and wide, apiculate tip *c.* 1 mm long and 0.2 mm wide. Ovaries not dissected. Pollinaria *c.* 0.8 mm long, 1.6–1.7 mm wide; pollinia ellipsoid, *c.* 0.8 mm long and 0.5 mm wide, yellow; corpusculum ovate, *c.* 0.7 mm long and 0.4 mm wide, tan-brown; caudicles *c.* 0.3 mm long and 0.1 mm wide. Follicles and seeds not seen. **Fig. 1.**

***Additional specimen examined*: Papua New Guinea.** Morobe Province: Lae, hills near Taraka, 6° 39'S, 146° 56'E, Aug 2004, *Takeuchi, Ama & Morris 17029* (A, BRI, CANB, LAE).

***Distribution and habitat*:** Many of the circumstances surrounding the original discovery of *M. arachnoidea* are still unknown. Although the principal details from Schlechter's expeditions have been compiled in summary form (itineraries, place names, and trip routes; see appendices in Schlechter 1911–14), the type locality 'above Dschischungari' is nowadays impossible to place precisely as there is no longer any record of such a village (e.g., Department of District Administration 1968; Anonymous 1970). By reconstructing Schlechter's itinerary, it is otherwise clear that the species was first discovered somewhere in the south-easternmost part of the Bowutu Range (Dischore Range *fide* Schlechter), in proximity to what is today known as Mt Hahl (**Map 1**). A recent trip to this general vicinity (by one of the authors) was aborted by land ownership disputes. Investigation of the lower drainage by orchidologists has previously resulted in the rediscovery of several Schlechter species (Clements & Ziesing 1990). Although the Bowutu Range is the most extensive series of ultrabasic environments in New Guinea, the presumed type locality for *M. arachnoidea* is apparently outside the serpentine zone (see Dow & Davies 1964). While this is not entirely certain because of the geographic imprecision of the type, the new record at Taraka is clearly from a non-ultrabasic habitat.

At the Taraka locality, *M. arachnoidea* occurs as an umbrophile in remnant patches of lowland rainforest between 200-300 m elevation. On the current system of forest resource classification (Hammermaster & Saunders 1995a) the new site is mapped as a medium-crowned low elevation forest (structural code Hm). The entire subdistrict is experiencing severe impacts from anthropogenic development, and the latest vegetation overlays are already outdated (Hammermaster & Saunders 1995b). The regrowth mosaic around Lae currently extends to a front about 16 km outside the city.

The rediscovery of *M. arachnoidea* is extremely ironic, in view of the plant's prolonged

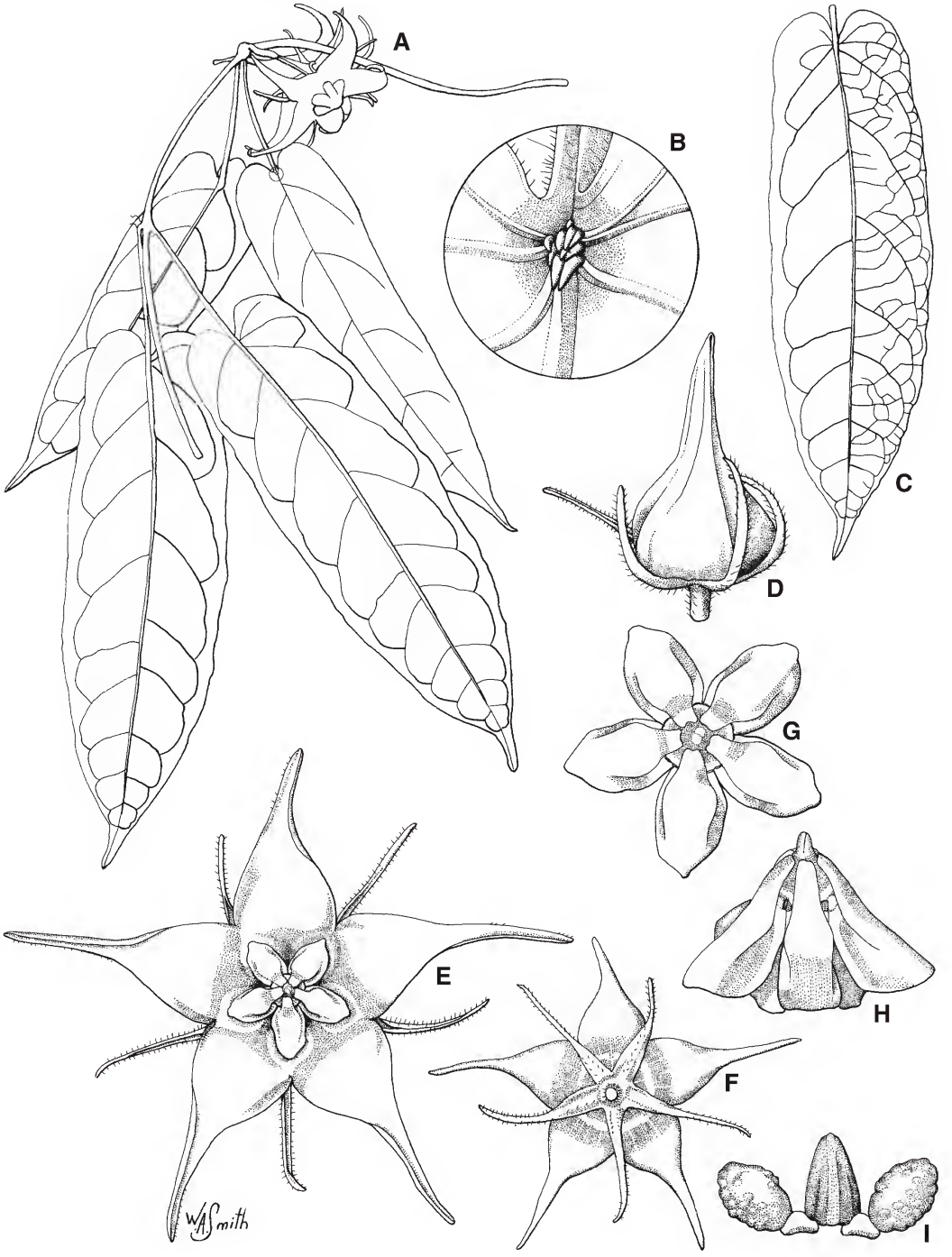


Fig. 1. *Marsdenia arachnoidea*. A. stem with flowering inflorescence ×0.5. B. base of leaf lamina with colleters ×6. C. adaxial leaf surface showing venation ×0.5. D. bud ×1.5. E. face view of flower ×1.5. F. back view of flower shosing sepals ×1. G. face view of staminal column and corona ×3. H. side view of staminal column and corona ×3. I. face view of pollinarium ×20. All from *Takeuchi 16667* (BRI). Del. W. Smith.

absence from the scientific record and the belated realization that it has been present all this time on the outskirts of PNG's second largest city. The new occurrence is just 5 km from the University of Technology, the principal training center for forestry science in the country, and is only 7-8 km from the National Herbarium. *Tapeinosperma magnifica* Pipoly & Takeuchi was recently described from the same habitat as the new populations of *M. arachnoidea* and the two species occur together in the Taraka understory.

***Typification*:** For various reasons (logistics, land access, habitat alteration), it is unlikely that *M. arachnoidea* will be recollected at the location where it was found by Schlechter nearly 100 years ago. In view of the desirability of typifying such an unusual species, a neotype has been designated from the recent collections obtained near Lae.

***Notes*:** Although the Taraka collections are referable to *Marsdenia arachnoidea*, there are some minor differences between these specimens and the one illustrated by Schlechter (1913). In the type collection, the sepals were noticeably longer than the corolla lobes, whereas in the new collections they are slightly shorter, and sometimes as small as one-half the length of the corolla. Irrespective of this variation, the filiform sepals are highly distinctive and quite unlike those in any other species of *Marsdenia*. The single leaf depicted in Schlechter's figure is also much longer and with more lateral veins (possibly up to 15, versus 9 or 10) than in the specimens at hand. These distinctions may warrant future recognition at the infraspecific level, but such determination will require examination of specimens from the original locality.

Marsdenia arachnoidea has morphological affinities to *M. hemiptera* H.Rchb. and *M. jensenii* P.I.Forst. from Australia, and to *M. brunnea* P.I.Forst., *M. grandis* P.I.Forst. and *M. lorea* S.Moore from New Guinea. The diagnostic differences between these species are discussed in Forster (1995, 1997).

***Conservation status*:** Based on existing information, the conservation outlook for *M. arachnoidea* is precarious. Morobe Province is probably the most comprehensively collected area in New Guinea (Conn 1994; Johns 1995) and this rather spectacular species having been collected only thrice in nearly 100 years indicates that it is genuinely rare, rather than merely overlooked. Shortly after the neotype was obtained, the collection site for *Takeuchi & Ama 16667* was destroyed by forest-clearing in a process recalling the discovery of *Madangia inflata* P.I.Forst., D.J.Liddle & I.M.Liddle from a similarly impacted area (Forster *et al.* 1997). Forest removal by subsistence agriculture and industrial logging is a serious and ongoing process in many parts of PNG.

A disproportionate number of asclepiads from New Guinea are under collected and consequently poorly known. This is exemplified by the startling fact that twenty-one of the fifty species of Papuasian *Marsdenia* that are currently recognised (Forster 1996) are represented by single collections (Forster 1995). As is often the case with relatively inconspicuous taxa, it is likely that additional populations will be eventually discovered for the single-record plants (Forster 2000). Although the conservation status of *M. arachnoidea* is undoubtedly 'Data Deficient' (IUCN 2001), the recently documented occurrences can be provisionally considered as 'Critically Endangered' under the Criterion B2 as the area of occupancy is under 10 km² with one extant location (a) and there is a continuing decline in the area, extent and/or quality of habitat (b(iii)) and of the number of locations or subpopulations (b(iv)).

***Etymology*:** The specific epithet is derived from the Latin *arachnoideus* (cobwebby), a probable allusion by Schlechter to the appearance of the flowers and their superficial similarity to species of *Brachystelma* R.Br. ex Sims from South Africa and Papua New Guinea with which he was familiar (Schlechter 1895, 1913; Nicholas 1992; Forster 1994). A number of *Brachystelma* species (e.g. *B. dinteri* Schltr., *B. elongatum* (Schltr.) N.E.Br., *B. glabriflorum* (F.Muell.) Schltr., *B. longifolium* (Schltr.) N.E.Br. and *B. meyerianum* Schltr.) have a dense indument of trichomes on adaxial corolline surfaces. This indument can impart a 'fuzzy' or 'cobwebby' appearance to the flowers.

Acknowledgements

Thanks to Will Smith (BRI) for preparing the illustrations and to Demas Ama and Ephraim Morris for assistance with the fieldwork.

References

ANONYMOUS. (1970). *An alphabetical list of villages in Papua and New Guinea*. The Library, University of Papua and New Guinea: Waigani.

CLEMENTS, M.A. & ZIESING, P. (1990). Report on the results of the Schlechter-Lauterbach Commemorative Expedition 1989–90: studies in the phylogeny of the Australasian Orchidaceae. *Australian National Botanic Gardens, Occasional Publication 11*. Australian National Botanic Gardens: Canberra.

CONN, B.J. (1994). Documentation of the flora of New Guinea. In C.-I. Peng & C.H. Chou (eds.), *Biodiversity and Terrestrial Ecosystems,* pp. 122–156. Academia Sinica Monograph Series No. 14. Institute of Botany: Taipei.

DEPARTMENT OF DISTRICT ADMINISTRATION. (1968). *Village Directory. Territory of Papua and New Guinea*. G.W. Reid, Acting Govt. Printer: Port Moresby.

DOW, D.B. & DAVIES, H.L. (1964). The geology of the Bowutu Mountains, New Guinea. *Australia Bureau Mineral Resources, Geology and Geophysics Report* 75: 1–31.

FORSTER, P.I. (1994). Type collections of African Asclepiadaceae in the National Herbarium of Victoria (MEL). *Muelleria* 8: 141–149.

FORSTER, P.I. (1995). Circumscription of *Marsdenia* (Asclepiadaceae: Marsdenieae), with a revision of the genus in Australia and Papuasia. *Australian Systematic Botany* 8: 709–933.

FORSTER, P.I. (1996). A checklist of the Asclepiadaceae of Papuasia. *Science in New Guinea* 22: 15–22.

FORSTER, P.I. (1997). *Marsdenia jensenii* (Asclepiadaceae: Marsdenieae), a new species from north-eastern Queensland. *Austrobaileya* 5: 59–61.

FORSTER, P.I. (2000). Rediscovery of *Dischidia torricellensis* (Schltr.) P.I.Forst., an unusual epiphytic asclepiad from New Guinea. *Austrobaileya* 5: 725–728.

FORSTER, P.I., LIDDLE, D.J. & LIDDLE, I.M. (1997). *Madangia inflata* (Asclepiadaceae: Marsdenieae), a new genus and species from Papua New Guinea. *Austrobaileya* 5: 53–57.

HAMMERMASTER, E.T. & SAUNDERS, J.C. (1995a). Forest Resources and Vegetation Mapping of Papua New Guinea. PNGRIS Publ. no. 4. CSIRO and AIDAB: Canberra.

HAMMERMASTER, E.T. & SAUNDERS, J.C. (1995b). Forest Resources and Vegetation Mapping of Papua New Guinea. 1:250,000 vegetation map overlays separately issued as working copies to PNGRIS Publ. no. 4. CSIRO and AIDAB: CSIRO.

IUCN (2001). *IUCN Red List Categories and Criteria Version 3.1*. IUCN – The World Conservation Union: Gland (Switzerland).

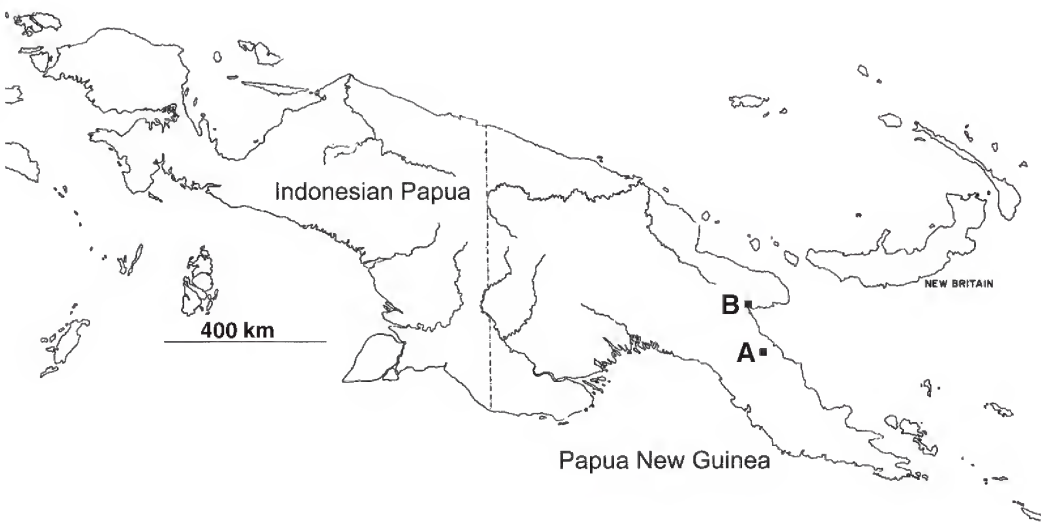
JOHNS, R.J. (1995). Malesia – an introduction. *Curtis's Botanical Magazine n.s.* 12: 52–62.

NICHOLAS, A. (1992). The Asclepiadaceous works of Rudolf F. Schlechter (1872-1925). *Willdenowia* 22: 215–264.

SCHLECHTER, R. (1895). Beiträge zur Kenntnis südafrikanischer Asclepiadaceen. *Botanische Jahrbücher Systematische* 20, *Beiblatt zu den Botanischen Jahrbüchen* 51: 1–56.

SCHLECHTER, R. (1911-14). Die Orchidaceen von Deutsch-Neu-Guinea. *Fedde Repertorium Specierum Novarum Regni Vegetabilis, Beiheft* 1: 1–1079. English translation 1982, D.F. Blaxell (ed). The Australian Orchid Foundation: Melbourne.

SCHLECHTER, R. (1913). Die Asclepiadaceen von Deutsch-Neu-Guinea. *Botanische Jahrbücher für Systematik Pflanzengeschichte und Pflanzengeographie* 50: 81–164.



Map 1. Island of New Guinea. Localities for *M. arachnoidea*. A. The type locality (above Dschischungari) as inferred from Schlechter's itinerary, Morobe Province. B. Taraka, Lae subdistrict, Morobe Province.

Ludwig Leichhardt's Australian plant collections, 1842-1847

John Leslie Dowe

Summary

Dowe, J.L. (2005). Ludwig Leichhardt's Australian plant collections, 1842-1847. *Austrobaileya* 7(1): 151–163. The contribution made by Ludwig Leichhardt to Australian botany is examined with reference to his collections and their use as types. About 2800 specimens collected by Leichhardt were located, of which at least 78 specimens have been designated as types. Leichhardt's records of species distribution, and manuscript names, are also examined. Forty-nine eponyms, named for Leichhardt, are listed.

Key Words: Australian botany, Ludwig Leichhardt, Overland Expedition, botanical exploration

J.L. Dowe, Australian Centre for Tropical Freshwater Research, James Cook University, Douglas, Queensland 4811, Australia.

Introduction

The plant collections and botanical observations that were made by Australia's colonial explorers contributed to the major taxonomic and systematic treatments produced at the time. Works such as *Flora Australiensis* (Bentham 1863-1878) and *Fragmenta Phytographiae Australiae* (Mueller 1858-1882), were predominantly based on collections by explorers such as Mitchell, Sturt, Gregory, Giles, and Leichhardt, among others, as well as botanists, such as Banks & Solander, Brown, Caley, Dietrich, C. Moore and Cunningham (Maiden 1908; Blake 1955; Hall 1978; Orchard 1999).

Ludwig Leichhardt

The exploration activities of [Friedrich Wilhelm] Ludwig Leichhardt (b. Prussia, 23 Oct.1813, d. central Australia? 1848) have made him one of Australia's most memorable and controversial colonial figures (Jack 1921; Neumayer 1944; Chisholm 1955; Allingham 1977; Desmond 1977; Dalton 1986; Roderick 1988; Barker & Barker 1990; Priessnitz 1991; Levitus 1995; Pearn 2001). His contribution to botany, though well recognised by some (Maiden 1908; Moore 1920; Blake 1955; Hall 1978; Webster 1980; Filson 1992; Orchard 1999; Short 2003), has been oddly disparaged by others who have chosen to emphasise his enigmatic and controversial status (Chisholm 1955; Webb 2003). This paper aims to provide an overview of his collecting activities, the use of his specimens as types, and his contribution to botany in Australia.

Accepted for publication 12 July 2005

Methods

Citations and other references to collections made by Leichhardt were located in *Flora Australiensis* (Bentham 1863-1878), and *Fragmenta Phytographiae Australiae* (Mueller 1858-1882), as well as other relevant works. The determination and updating of nomenclature were primarily achieved through access to Henderson (2002), APNI (2004), IPNI (2004), and published volumes in the *Flora of Australia* series. Unpublished Queensland Herbarium data, based on Henderson (2002) were designated as the standard in the event of conflicting nomenclature. Literature pertaining to Leichhardt's Overland Expedition was examined and parts relevant to vegetation or botany were appraised and where appropriate were used as references within the text. Searches for Leichhardt's plant specimens were done in B, BM, BRI, E, HO, K, MEL, NSW and P. Herbarium acronyms are according to Holmgren *et al.* (1990).

Results

Arriving in Australia in February 1842 from Germany where he received an education in the natural sciences at Göttingen and Berlin Universities, Leichhardt undertook three major expeditions. The first was the Overland Expedition from the Darling Downs to Port

Essington, Oct.1844-Dec.1845 (Leichhardt 1847b). The second was an unsuccessful attempt to cross Australia from east to west, which commenced in Brisbane in December 1846, but was compelled to return because of illness and the loss of stock after six months (Bunce 1859; Sprod 1989). The third, also an attempt to cross Australia from east to west, commenced in March 1848, and resulted in the disappearance of Leichhardt and his entire party, of which no remains have ever been found (Connell 1980).

Of the specimens collected by Leichhardt during his five years of activity in Australia, the number would have been considerably greater had Leichhardt not been forced to abandon most of his plant and geology specimens during the Overland Expedition because of the drowning of the pack-horses, and other unfortunate incidents. In correspondence to his brother-in-law C. Schmalfuss [24 January 1846], Leichhardt reported that, during the Expedition, he had to "*....burn about 3000 dried plants....*" whilst in correspondence to G. Durando of the Paris herbarium [20 May 1846] he wrote "*.... As my collection increased, I surrounded the different packages with green hide, which when dry, formed a fine box round them, and protected them from hard usage to which they were exposed....the time came when I had to open all my fine green hide boxes, to make a poor choice of the dried plants, and to throw the greatest number of them away unable to carry them any farther, as four of my pack horses drowned, and the means of carrying my collections of plants and geological specimens were consequently destroyed. I fully lost 4-5000 specimens. There are however still some very interesting remnants...*" (Politzer 1944; Aurousseau 1968). Furthermore, additional losses were incurred when a bullock carrying his remaining specimens "*plunged into a deep pond, where he was quietly swimming about and enjoying himself, whilst I was almost crying with vexation at seeing all my plants thoroughly soaked*" (Leichhardt 1847b, p. 469). The majority of Leichhardt's extant specimens were collected in locations that are now southeast Queensland, central and northern New South Wales, and the Port Essington area in the Northern Territory (Webster 1980). Leichhardt published his diary of the Overland Expedition in the form of a journal that was edited by geographer and surveyor P.P. King (Leichhardt 1847b). Hooker (1860, p. cxxi) noted that the journal, at the time, was "*....by far the fullest published detailed account of the tropical vegetation of the interior of Australia that we possess*".

At the time that Leichhardt was engaged in his exploration activities, systematic studies of the Australian flora were relatively rudimentary. Leichhardt's primary references were those of Brown (1810, 1830) and volumes 1-7 of Candolle and Candolle (1823-1839) (Aurousseau 1968). Those works dealt primarily with the plants of the coastal and near-coastal regions, of settled areas and where exploration had previously occurred. The floras of central and northern Australia were yet to be fully appreciated and studied, and it is in this context that Leichhardt framed his scientific attention.

Apart from Leichhardt's specimens subsequently being used in the formulation of taxonomic descriptions, Leichhardt's botanical observations in the journal of the Overland Expedition were often quoted. For example, Bentham (1864, p. 297) noted in his description of *Erythrophleum chlorostachys* (F.Muell.) Baill., as "*also in Leichhardt's collection, and said to be his 'leguminous Iron-bark tree'*" – and Leichhardt's original: "*a leguminous tree, with the dark fissured bark of the Ironbark....*" (Leichhardt, 1847b, p. 242). Mention was made by Bentham (1866, p. 408) with regards to *Gardenia edulis* F.Muell., [= *G. vilhelmii* Domin] of the Gilbert and Lynd Rivers, "*....the "Breadfruit-tree" of Leichhardt....*", though correctly the '*Bread tree*' in the Journal (Leichhardt 1847b, p. 273). Mueller (1866a), in his taxonomic account of *Xylomelum scottianum* (F.Muell.) F.Muell., suggested that this was probably the species noted by Leichhardt in his Journal. The journal entry of May 22, 1845, in the vicinity of Separation Creek was: "*.... a Xylomelum, with smooth and smaller seed-vessels than those of X. pyriforme*" (Leichhardt 1847b, p. 263). Mueller, in naming *Bauhinia leichhardtii* F.Muell., noted that Leichhardt "*referred to it repeatedly in his journal*" (Mueller, 1859, p.51), and with reference to *Loranthus grandibracteus*, Mueller (1860,

p. 150) noted that this species was "*cursorily mentioned in the diary of that lamented traveller*".

It was beyond the scope of this paper to both confirm the existence and whereabouts of all Leichhardt's collections, and to determine the type status of those specimens that have been designated as types. However, herbarium searches yielded about 2800 specimens, which most likely form the bulk of Leichhardt's collections. Of these, at least 78 specimens have been designated as types (**Appendix**).

Leichhardt published no taxonomic work, although he provided accounts that were published within the botanical domain, including an overview of his botanical activities of 1842-1844 (Leichhardt 1845), letters sent to G. Durando of Paris, (Leichhardt 1846), lecture transcripts (Leichhardt 1847a) that contained proposed species names (**Table 1**), and his Journal of an Overland Expedition (Leichhardt 1847b). These publications outlined the extent of Leichhardt's travels and his plant collecting activities. As well, many minor articles were published in newspapers and magazines in Australia, England and Germany (Aurousseau 1968; Hoare 1981).

Heward (1847) provided an account of the botany of Leichhardt's Overland Expedition which drew primarily from Leichhardt's paper published in the *Tasmanian Journal of Natural Science* (Leichhardt 1847a), and it is reasonable to assume, based on Heward making no reference to specimens, that he did not examine any Leichhardt specimens collected during the Overland Expedition. More recently, Jackes (1990) provided an assessment of Leichhardt's botany for the Lynd, Mitchell and Nassau Rivers area, based on Leichhardt's descriptions and names. That account identified species as noted by Leichhardt in his Journal.

With further regard to taxonomy, Leichhardt was cited as author of *Kallstroemia minuta* (Leichh. ex Benth.) Engl. (Engler 1897; Barker 1998), with Engler's transfer of *Tribulopsis minutus* Leichh. ex Benth. to *Kallstroemia*. The type for *Tribulus minutus* Leichh. ex Benth. is "*Queensland (?). Leichhardt's Expedition*" and is extant in K. Engler's work is an illegal combination and he should have cited this taxon as *Tribulus minutus* Leichh. ex Benth., not as a *Tribulopsis*, as *Tribulus* is the genus in which Bentham (1863) formerly established the taxon. The reason that Bentham originally cited Leichhardt as the author is not documented, and it could be surmised that Leichhardt may have provided some notes about the species. Bentham's (1863) author citation of '*Leichh. in Herb. F. Muell.*'

Table 1. Plant names used by Leichhardt (1845, 1847), and which have not been taxonomically accepted and are designated nomina nuda.

Taxon	Reference and citation
Acacia equisetifolia	Journ. Overl. Exped. 356 (1847) "*In a patch of rusty-gum forest we found Acacia equisetifolia....*" Tas. Journ. Nat. Sc. 3: 97 (1847) "*Grevillea ceratophylla, and Acacia equisetifolia, were first met with in latitude 19° 19'.*"
Casuarina villosa	Journ. Overl. Exped. 49 (1847) "*a new species of forest oak, which deserves the name Casuarina villosa, for its bark looks quite villous*"
Grevillea lanceolata	Tas. Journ. Nat. Sc. 3: 97 (1847) "*Grevillea lanceolata, a new species with broad lanceolate leaf, thus named by me, showed itself first at the Suttor, where it was growing on a light sandy soil with Pandanus spiralis.*"
Zamia australis	London J. Bot. 4: 279 (1845) "*The grass tree (Xanthorrhoea) gives a peculiar character to many spots, and Zamia australis is no less striking.*"

suggests this. To my knowledge, the only published reference to *Tribulus* made by Leichhardt is that in which he noted the presence of "*a species of Tribulus*" at Comet Creek (Leichhardt 1847b, p. 87). Barker (1998, p. 32) stated that the type for *T. minutus* was "[Queensland, Leichhardt District], before Canal [pastoral run] and afterwards, *s. dat.*, *L. Leichhardt s.n.* (*syn*: MEL *s.n.*, *p.p.*, excluding lower LHS specimen); without locality, *Leichhardt's Expedition, s.dat., Herb. Mueller* (*syn*: K-Herb. Hooker, type seen photographs in the Eichler manuscripts)". Furthermore, Barker (1998) indicated that there was a specimen in MEL (*Leichhardt 26*, MEL) that was annotated by Leichhardt as "*Tribulus parviflorus mihi*" from Bokkara Flats, 3 January 1847. Barker placed this specimen under *Tribulus micrococcus* Domin.

Leichhardt provided material for an illustration of the fungus *Aseroe rubra* Labill. (Phallaceae) that was published in an account of the fungi in the Hooker collection (Berkeley 1844). Labillardière (1806) had earlier described the fungus. Leichhardt collected the specimen in Sydney in 1842. With regards to examination of specialised collections, Mueller (1866b) provided a summary of the ferns collected by Leichhardt, and Filson (1992) noted that Mueller sent to European researchers a small number of lichen specimens that were collected by Leichhardt.

Conclusion

The contribution made by Leichhardt toward the development of botany in Australia is acknowledged in a number of ways. Mueller, Bentham and others noted over 500 Leichhardt collections in works, about 2800 specimens have been located in herbaria, and at least 78 specimens have been designated as types. In relative terms this is a high proportion of types to numbers collected. Leichhardt's name is commemorated in at least 49 taxa (**Table 2**), of which about half are currently in use. In addition, Leichhardt's journal provided valuable distribution information that was subsequently used by taxonomists in various treatments. Leichhardt's descriptions of the potential pastoral value of areas that he passed through were used in determining patterns of settlement and development of pastoral and mining industries.

Acknowledgments

I would like to thank the following people who contributed in many ways to this paper: Tony Bean (BRI), Helen Cohen (MEL), Barry Conn (NSW), Roberta Cowan (ABLO-Kew, 2003), Marco Duretto (HO), Rod Fensham (BRI), Paul Forster (BRI), Catherine Gallagher (MEL), Alex George (ABLO-Kew, 2005), Ken Hill (NSW), Ailsa Holland (BRI), Betsy Jackes (JCT), Bob Makinson (NSW), Les Pedley (BRI), Chris Quinn, Annette Wilson (ABLO-Kew, 2004) and Peter Wilson (NSW).

References

Allingham, A. (1977). *Taming the wilderness: the first decade of pastoral settlement in the Kennedy District*. History Department, James Cook University: Townsville.

Apni (2004). *Australian plant name index*. www.anbg.gov.au/cpbr/databases/apni.html.

Aurousseau, M. (1968). *The letters of F.W. Ludwig Leichhardt*. Cambridge University Press: London.

Barker, R.M. (1998). A trial key and notes on *Tribulus* (Zygophyllaceae) in Australia, including one new species and validation of *Tribulus suberosus*. *Nuytsia* 12: 9–35.

Barker, R.M. & Barker, W.R. (1990). Botanical contributions overlooked: the role and recognition of collectors, horticulturists, explorers and others in the early documentation of the Australian flora. In P.S. Short (ed.), *History of systematic botany in Australasia*, pp. 37–85. Australian Systematic Botany Society Inc.: South Yarra.

Bentham, G. (1863). *Tribulus* Linn. In *Flora Australiensis* 1: 289–291. L.Reeve & Co.: London.

Bentham, G. (1863–1878). *Flora Australiensis*, Vols 1–7. L.Reeve & Co.: London.

Bentham, G. (1864). *Erythrophloeum laboucherii* F.Muell. In *Flora Australiensis* 2: 297. L.Reeve & Co.: London.

Bentham, G. (1866). *Gardenia edulis* F.Muell. In *Flora Australiensis* 3: 408. L.Reeve & Co.: London.

Berkeley, M.J. (1844). Decades of fungi. *London Journal of Botany* 3: 185–194.

Blake, S.T. (1955). Some pioneers in plant exploration and classification. *Proceedings of the Royal Society of Queensland* 66: 1–19.

Brown, R. (1810). *Prodromus Florae Novae Hollandiae et Insulae Van-Diemen*. Taylor: London.

Table 2. Taxa named for Ludwig Leichhardt. Currently accepted taxa honouring Leichhardt indicated in bold

Name honouring Leichhardt	Current Accepted Name for taxon
Acacia decurrens var. *leichhardtii* Benth	*Acacia oshanesii* F.Muell. & Maiden
Acacia leichhardtii Benth.	no change
Acacia mollissima var. *leichhardtii* F.Muell. ex Maiden	*Acacia pubescens* (Vent.) R.Br.
Alsophila leichhardtiana F.Muell.	**Cyathea leichhardtiana** (F.Muell.) Copel.
Amanoa leichhardti Baill.	**Bridelia leichhardtii** Baill. ex Müll.Arg.
Anthocercis leichhardtii F.Muell.	**Duboisia leichhardtii** (F.Muell.) F.Muell.
Aristida leichhardtiana Domin	No change
Bauhinia leichhardtii F.Muell.	*Lysiphyllum cunninghamii* (Benth.) de Wit
Carex inversa R.Br. var. *leichhardtii* Boeck.	*Carex inversa* R.Br.
Chorizema leichhardtii F.Muell.	*Isotropis filicaulis* Benth.
Clematis aristata var. **leichhardtiana** Kuntze	No change
Commersonia leichhardtii Benth.	No change
Datura leichhardtii F.Muell. ex Benth.	No change
Dendrohypnum leichardtii A.Jaeger	**Camptochaete leichhardtii** (A.Jaeger) Broth.
Dicranum leichhardtii Hampe	**Dicranoloma leichhardtii** (Hampe) Watts & Whitel.
Digitaria macractinia subsp. **leichhardtiana** Henrard	No change
Eriostemon leichhardtii F.Muell.	*Halfordia kendack* (Montrouz.) Guillaumin
Eriostemon myoporoides var. *leichhardtii* Benth.	*Philotheca glasshousiensis* (Domin) P.I.Forst.
Eriostemon trachyphyllus var. *leichhardtii* Benth	*Philotheca glasshousiensis* (Domin) P.I.Forst.
Eucalyptus leichhardtii F.M.Bailey	**Corymbia leichhardtii** (F.M.Bailey) K.D.Hill & L.A.S.Johnson
Euphoria leichhardtii Benth.	*Dimocarpus longan* Lour.
Flindersia leichardtii C.D.C.	*Flindersia bennettiana* Benth.
Euphoria leichhardtii var. *hebepetala* Benth.	*Arytera foveolata* F.Muell.
Grevillea leichardtii S.Moore	*Grevillea pungens* R.Br.
Halfordia leichhardtii F.Muell. ex Guillaumin	*Halfordia kendack* (Montrouz.) Guillaumin
Harpullia leichhardtii F.Muell. ex Benth.	No change
Hypnum leichardtii Hampe	**Camptochaete leichhardtii** (Hampe) Broth.
Kunzea opposita var. *leichhardtii* Byrnes	No change
Leichhardtia F.Muell.	*Phyllanthus* L.
Leichardtia R.Br.	*Marsdenia* R.Br.
Leichhardtia T.Shepard	*Callitris* Vent.
Leichardtia australis R.Br.	*Marsdenia australis* (R.Br.) Druce

Table 2 (continued) . Taxa named for Ludwig Leichhardt. Currently accepted taxa honouring Leichhardt indicated in bold

Name honouring Leichhardt	Current Accepted Name for taxon
Lobelia leichhardii E.Wimm.	No change
Livistona leichhardtii F.Muell.	*Livistona humilis* R.Br.
Macropteranthes leichhardtii F.Muell. ex Benth.	No change
Marsdenia leichhardtiana F.Muell.	*Marsdenia australis* (R.Br.) Druce
Morinda leichhardtii F.Muell.	No change
Najas leichhardtii Magnus	No change
Neckera leichhardtii Hampe	*Neckera pennata* Hedw.
Parsonsia leichhardtii F.Muell.	No change
Prostanthera leichhardtii Benth.	*Prostanthera ringens* Benth.
Psoralea leichhardtii F.Muell.	*Indigofera glandulosa* Willd.
Rotala occultiflora var. *leichhardtii* Koehne	*Rotala occultiflora* Koehne var. *occultiflora*
Rubus moorei var. *leichardtianus* Domin	*Rubus moorei* F.Muell. var. *moorei*
Sarcocephalus leichhardtii F.Muell.	*Nauclea orientalis* (L.) L.
Unona leichardtii F.Muell.	**Melodorum leichhardtii** F.Muell.
Urera leichhardtiana Wedd.	*Dendrocnide photinophylla (*Kunth) Chew
Urostigma leichhardtii Miq.	**Ficus platypoda** var. **leichhardtii** (Miq.) R.J.F.Hend.
Vitex leichhardtii F.Muell.	**Gmelina leichhardtii** F.Muell.

Brown, R. (1830). *Supplementum Primum Prodromi Florae Novae Hollandiae*. Taylor: London.

Bunce, D. (1859). *Travels with Dr. Leichhardt in Australia*. W. Fairfax & Co.: Melbourne.

Candolle, A.P. de & Candolle, A.L.P.P. de (1823–1839). *Prodromus systematis naturalis regni vegetabilis*. Treuttel & Wurtz: Paris.

Chisholm, A.H. (1955). *Strange new world: the adventures of John Gilbert and Ludwig Leichhardt*. Angus and Robertson: Sydney.

Connell, G. (1980). *The mystery of Ludwig Leichhardt*. Melbourne University Press: Carlton.

Dalton, B.J. (1986). The nature of the 'gin': a note on 'Whirlwinds in the plain'. *Aboriginal History* 10: 152–156.

Desmond, R. (1977). *Dictionary of British and Irish botanists and horticulturists*. Taylor & Francis: London.

Engler, A. (1897). Zygophyllaceae. In A. Engler & K. Prantl (eds), *Die natürlichen Pflanzenfamilien* Teil 3, ab. 4, pp. 74–93. Wilhelm Engelmann: Leipzig.

Filson, R.B. (1992). History of Australian lichenology. *Flora of Australia* 54: 2–11.

Hall, N. (1978). *Botanists of the eucalypts*. CSIRO: Melbourne.

Henderson, R.J.F. (2002). *Names and distribution of Queensland plants, algae and lichens*. Queensland Environmental Protection Agency: Toowong.

Heward, R. (1847). Some observations on Dr. Leichardt's overland journey from Moreton Bay on the east coast of Australia to Port Essington on the north coast: with a map. *London Journal of Botany* 6: 342–364.

Hoare, M. (1981). Botany and society in eastern Australia. In D.J. Carr & S.G.M. Carr (eds.), *People and plants in Australia*, pp. 183–219. Academic Press: Sydney.

Holmgren, P.K., Holmgren, N.H. & Barnett, L.C. (1990). *Index herbariorum*. Part 1. The herbaria of the world. *Regnum. veg.* 120: 1–693.

Hooker, J.D. (1860). The botany of the Antarctic voyage of H. M. discovery ships Erebus and Terror, 1839-43, under the command of

Captain Sir James Clark Ross, Kt., R.N., F.R.S., & L.S., Etc. Part III. *Flora Tasmaniae*, Vol. 1. Dicotyledones. Lovell Reeve: London.

IPNI (2004). *International plant name index*. www.ipni.org/index.html.

JACK, R.L. (1921). *Northernmost Australia*. Simpkin, Marshall, Hamilton, Kent & Co. Ltd.: London.

JACKES, B.R. (1990). Retracing the botanical steps of Leichhardt and Gilbert in June 1845. In P.S. Short (ed.), *History of systematic botany in Australasia*, pp. 165–169. Australian Systematic Botany Society Inc.: South Yarra.

LABILLARDIERE, J.-J. (1806). Cryptogamic fungi. *Aseroe. Novae Hollandiae Plantarum Specimen* 2: 124.

LEICHHARDT, L. (1845). Scientific excursions in New Holland, by Dr. Ludwig Leickhardt, 1842-44; extracted from his letters to M. G. Durando, of Paris. *London Journal of Botany* 4: 278–291.

LEICHHARDT, L. (1846). Botanical information - Extracted from a letter from Dr. Ludwig Leickhardt of New Holland to M. Durando, of Paris. *London Journal of Botany* 5: 656–660.

LEICHHARDT, L. (1847a). Lectures on the geology, botany, natural history, and capabilities of the country between Moreton Bay and Port Essington. *Tasmanian Journal of Natural Science* 3(2): 81–113.

LEICHHARDT, L. (1847b). *Journal of an overland expedition in Australia, from Moreton Bay to Port Essington, a distance of upwards of 3000 miles, during the years 1844-1845*. T. & W. Boone: London.

LEVITUS, R. (1995). Social history since colonisation. In T. Press, D. Lea, A. Webb & A. Graham (eds), *Kakadu, natural and cultural heritage and management*, pp. 64–93. Australian Nature Conservation Agency, North Australia Research Unit, Australian National University: Darwin.

MAIDEN, J.H. (1908). Records of Australian botanists (a) general, (b) New South Wales. *Journal & Proceedings of the Royal Society of New South Wales* 42: 60–132.

MOORE, S.L.M. (1920). A contribution to the flora of Australia. *Journal of the Linnean Society, Botany* 45: 159–220.

MUELLER, F. (1858-1882). *Fragmenta phytographiae Australiae* Vol. 1–12. Government Printer: Melbourne.

MUELLER, F. (1859). Some hitherto unknown Australian plants. *Transactions of the Philosophical Institute of Victoria* 3: 40–63.

MUELLER, F. (1860). Essay on the plants collected by Mr. Eugene Fitzalan, during Lieut. Smith's expedition to the estuary of the Burdekin. Government Printer: Melbourne.

MUELLER, F. (1866a). *Xylomelum scottianum*. *Fragmenta phytographiae Australiae* 5: 174. Government Printer: Melbourne.

MUELLER, F. (1866b). Filicum in museo phytologico Melbourensi asservatarum Australian continentalem in habitantium imprimis de earum distributione agens breviarium. *Fragmenta phytographiae Australiae* 5: 111–142. Government Printer: Melbourne.

NEUMAYER, G. (1944). Dr. Ludwig Leichhardt as naturalist and explorer. In L.L. Politzer (ed.), *Dr. Ludwig Leichhardt's letters from Australia during the years March 23, 1842, to April 3, 1848*, pp. 71–95. Pan Publishers: Melbourne.

ORCHARD, A. (1999). A history of systematic botany in Australia, *Flora of Australia*, 2nd edn, 1: 11–103.

PEARN, J.H. (2001). *A Doctor in the garden, nomen medici in botanicis: Australian Flora and the World of Medicine*. Amphion Press: Brisbane.

POLITZER, L.L. (1944). *Dr. Ludwig Leichhardt's letters from Australia during the years March 23, 1842, to April 3, 1848*. Pan Publishers: Melbourne.

PRIESSNITZ, H. (1991). The 'Vossification' of Ludwig Leichhardt. In D. Walker & J. Tampke (eds.), *From Berlin to the Burdekin: the German contribution to the development of Australian science, exploration and the arts*, pp. 196–217. New South Wales University Press: Kensington.

RODERICK, C. (1988). *Leichhardt the dauntless explorer*. Angus and Robertson: North Ryde.

SHORT, P. (2003). *In pursuit of plants*. University of Western Australia Press: Crawley (WA).

SPROD, D. (1989). *Proud intrepid heart: Leichhardt's first attempt to the Swan River 1846-1847*. Blubber Head Press: Hobart.

WEBB, J.B. (2003). *The botanical endeavour: journey towards a flora of Australia*. Surrey Beatty & Sons: Chipping Norton.

WEBSTER, E.M. (1980). *Whirlwinds in the plain: Ludwig Leichhardt – friends, foes and history*. Melbourne University Press: Melbourne.

Appendix: Specimens, collected by Ludwig Leichhardt in Australia, that have been designated as types, with updated nomenclature, original literature citations and herbaria where specimens are kept. If specimens have been selected as lectotypes or have become lectoparatypes due to lectotypification this has not been indicated.

Akaniaceae *Cupania lucens* F.Muell., *Fragm.* 3: 44 (1862) = *Akania bidwillii* (Hogg.) Mabb., *Plant Book* 707 (1990)	*Ad sinum Moreton Bay; Leichhardt.*	cited but not located[not at K or BM]
Anacardiaceae *Rhus viticifolia* F.Muell. ex Benth., *Fl Austral.* 1: 489 (1863) = *Rhus tomentosa* L., *Sp.Pl.* 266 (1753)	*Queensland (?) Leichhardt*	K
Apocynaceae *Parsonsia leichhardtii* F.Muell., *Fragm.* 6: 128 (1868)	*Ad sinum Wide Bay; Leichhardt*	MEL
Asteraceae *Cassinia theodori* F.Muell., *Fragm.* 5: 148 (1866)	*In parietibus phonolithicis ad originem fluvii Gwydir; Dr. Ludw. Leichhardt*	K
Asteraceae *Helichrysum diotophyllum* F.Muell., *Fragm.* 5: 150 (1866) = *Ozothamnus diotophyllus* (F.Muell.) Anderb., *Op. Bot.* 104: 89 (1991)	*In Australia orientali subtropica ad flumen Dogwood Creek; Leichhardt et Bunce*	MEL, K
Boraginaceae *Cordia ixiocarpa* F.Muell., *Fragm.* 1: 59 (1858) = *Cordia myxa* var. *ixiophylla* (F.Muell.) Domin, *Biblioth. Bot.* 89(4): 1097 (1930)	*In collibus humilibus ad flumen Gilbert. Leichhardt, Mueller.*	cited but not located[not at K or BM]
Caesalpiniaceae *Cassia concinna* Benth., *Fl. Austral.* 2: 291 (1864) = *Chamaecrista concinna* (Benth.) Pedley, *Fl. Aust.* 12: 143, 196 (1998)	*N.S.Wales. Mount Flinders, Leichhardt*	MEL
Campanulaceae *Lobelia leichhardii* E.Wimm., *Das Pflanzenreich* 107: 584 (1953)	*Australien: Morton Bay, 1845 (Leichhard! - Hb. Paris)*	P
Casuarinaceae *Casuarina equisetifolia* var. *microcarpa* F.Muell., *Fragm.* 6: 17 (1867) = *Casuarina cunninghamiana* Miq. subsp. *cunninghamiana*, *Revisio critica Casuarinarum* 56 (1848)	*ad Glendon (Leichh.).*	MEL
Chenopodiaceae *Atriplex stipitata* Benth., *Fl. Austral.* 5: 168 (1870)	*N.S.Wales. also in Leichhardt's collection*	MEL
Chrysobalanaceae *Parinari nonda* F.Muell. ex Benth., *Fl. Austral.* 2: 426 (1864)	*N.Australia. From the Upper Lind to Van Dieman's river, Gulf of Carpentaria, Leichhardt*	MEL
Combretaceae *Macropteranthes leichhardtii* F.Muell. ex Benth., *Fl. Austral.* 2: 505 (1864)	*Queensland. Ruined Castle Creek Leichhardt.*	MEL, K
Combretaceae *Terminalia platyptera* F.Muell., *Fragm.* 2: 151 (1861)	*In plantiebus terrae Arnhem's Land et circum sinum Carpentariae.*	MEL
Cyathaceae *Alsophila leichhardtiana* F.Muell., *Fragm.* 5: 53 (1865) = *Cyathea leichhardtiana* (F.Muell.) Copel., *Philipp. J. Sc., C* 6: 360 (1911)	*Moreton Bay, Fern-tree Creek, Bunya Mountain, L. Leichhardt.*	MEL

Appendix (continued)

Cyperaceae *Carex inversa* var. *leichardtii* Boeck., *Linnea* 39: 70 (1875) = *Carex inversa* R.Br., *Prodr.* 242 (1810)	*Nova Holland., Paramatto (Leichardt)*	MEL
Cyperaceae *Cladium scleroides* F.Muell., *Fragm.* 9: 12 (1875) =*Exocarya scleroides* (F.Muell.) Benth., *Icones Plantarum* 13: t.1206 (1877)	*In silvis Araucariae Bidwilli prope fluvios Burnett's et Dawson's River, Leichhardt*	MEL
Epacridaceae *Styphelia exolasia* F.Muell., *Fragm.* 6: 34 (1867) = *Leucopogon exolasius* (F.Muell.) Benth., *Fl. Austral.* 4: 217 (1868)	*In vicinia pagi Camden Dre Ludiv. Leichhardt anno 1843 detecta*	K
Epacridaceae *Styphelia pleiosperma* F.Muell., *Fragm.* 6: 41 (1867) = *Leucopogon pleiospermus* (F.Muell.) Benth., *Fl. Austral.* 4: 207 (1868)	*In Australia orientali (loco speciali non indicato), Leichhardt*	K
Euphorbiaceae *Bridelia leichhardtii* Baill. ex Müll.Arg. in Candolle, A.P. de & Candolle, A.L.P.P. de (ed.), *Prodromus* 15(2): 499 (1886)	*In Nova Hollandia ad Moreton Bay (Leichhard! in hb. Mus. Paris).*	P
Euphorbiaceae *Claoxylon australe* Baill. ex Müll.Arg., *Étude Génerale du Groupe des Euphorbiacées*: 493 (1858)	*herb. Mus. Nouvelle-Hollande. Coll. Leichhard, 1845*	P
Euphorbiaceae *Croton stigmatosus* F.Muell., *Fragm.* 4: 140 (1864)	*ad sinum Moreton Bay, Dr. Leichhardt*	G-DC, MEL, P
Euphorbiaceae *Hemecyclia lasiogyna* F.Muell., *Fragm.* 4: 119 (1864) = *Drypetes deplanchei* (Brongn. & Griseb.) Merr., *J. Arnold Arbor.* 32: 199 (1951)	*In locis fontanis ad portum Essingtoni; Leichhardt*	MEL
Euphorbiaceae *Micrantheum ericoides* var. *juniperinum* Grun., *Das Pflanzenreich* 58: 25 (1913)	*Queensland (Leichhardt!)*	MEL
Fabaceae *Bossiaea brownii* Benth., *Fl. Austral.* 2: 163 (1864)	*Queensland. also in Leichhardt's Collection*	MEL
Fabaceae *Chorizema leichhardtii* F.Muell., *Fragm.* 4: 20 (1863) = *Isotropis filicaulis* Benth., *Fl. Austral.* 2: 40 (1864)	*In clivis arenoso- rupestribus ad sinum marinum Wide Bay; Dr. Ludw. Leichhardt*	MEL
Fabaceae *Flemingia parviflora* Benth., *Fl. Austral.* 2: 269 (1864)	*Queensland. Lynedoch valley, Leichhardt*	MEL
Fabaceae *Hovea heterophylla* A.Cunn. ex Hook.f. f. *decipiens* Domin, *Biblioth. Bot.* 89: 729 (1928) = *Hovea linearis* (Sm.) R. Br., *Hortus Kewensis Edn.* 2, 4: 275 (1812)	*sandstone hills towards Brisbane, Leichhardt*	MEL

Appendix (continued)

Fabaceae *Pultenaea paleacea* Willd. var. *obtusata* Benth., *Fl. Austral.* 2: 116 (1864) = *Pultenaea paleacea* Willd. var. *paleacea, Trans. Linn. Soc. London* 9: 246 (1808)	*between Suggerah and Lake Macquoy, Leichhardt*	MEL
Fabaceae *Sophora fraseri* Benth., *Fl. Austral.* 2: 274 (1864)	*Queensland. Murrum-Murrum Creek, Leichhardt*	MEL
Fabaceae *Swainsona brachycarpa* Benth., *Fl. Austral.* 2: 217 (1864)	*Queensland. Condamine river and Darling Downs, Leichhardt*	MEL, NSW
Fabaceae *Swainsona oroboides* F.Muell. ex Benth., *Fl. Austral.* 2: 222 (1864)	*N.S.Wales. head of Gwydir, Leichhardt*	MEL
Fabaceae *Templetonia muelleri* Benth., *Fl. Austral.* 2: 169 (1864) = *Templetonia stenophylla* (F.Muell.) J.M. Black, *Flora of South Australia* 4: 304 (1929)	*Queensland. Wide Bay, Bidwill, Leichhardt*	MEL
Fabaceae *Tephrosia filipes* Benth., *Fl. Austral.* 2: 208 (1864)	*Queensland. Erythrina Creek, Leichhardt*	MEL
Fabaceae *Tephrosia juncea* Benth., *Fl. Austral.* 2: 208 (1864)	*Queensland. also in Leichhardt's collection*	MEL
Fabaceae *Tephrosia purpurea* Pers. var. *rufescens* Benth., *Fl. Austral.* 2: 210 (1864) = *Tephrosia rufula* Pedley, *Austrobaileya* 1: 38 (1977)	*Archer's Hill, Leichhardt*	MEL, NSW
Mimosaceae *Acacia polybotrya* var. *foliolosa* Benth., *Fl. Austral.* 2: 414 (1864) = *Acacia glaucocarpa* Maiden & Blakely, *Proc. Roy. Soc. Queensland* 38: 120 (1927)	*Queensland. limestone hills, Leichhardt*	MEL
Mimosaceae *Acacia undulifolia* var. *humilis* Benth., *Fl. Austral.* 2: 356 (1864) = *Acacia hubbardiana* Pedley, *Contr. Queensland Herb.* 4: 2 (1969)	*also the Brisbane specimens from F.Mueller and Leichhardt*	MEL
Mimosaceae *Acacia leichhardtii* Benth., *Fl. Austral.* 2: 372 (1864)	*Queensland. Expedition range, Leichhardt*	K, NSW
Musci *Neckera leichhardtii* Hampe, *Linnaea* 36: 520 (1870) = *Neckera pennata* Hedw., *Sp. Musc. Frond.* 200 (1801)	*Hab. New South Wales leg. Leichhard*	BM
Myrsinaceae *Myrsine subsessilis* F.Muell., *Fragm.* 4: 81 (1864) = *Rapanea subsessilis* (F.Muell.) Mez., *Das Pflanzenreich* 9: 354 (1902)	*In silvis ad sinum Moreton Bay, Dr. Leichhardt*	NSW
Myrtaceae *Eucalyptus albens* Miq. ex Benth., *Fl. Austral.* 3: 219 (1867)	*N.S.Wales. between Alford's and the Range, "Box," Leichhardt*	MEL
Myrtaceae *Eucalyptus fibrosa* F.Muell., *J. Linn. Soc., Botany* 3: 87 (1859)	*In montibus nemorosis ad flumen Brisbane. Anth. aestate.*	MEL

Appendix (continued)

Myrtaceae *Thryptomene polyandra* F.Muell., *Fragm.* 4: 77 (1864) = *Homalocalyx polyandrus* (F.Muell.) F.Muell. ex Benth., *Fl. Austral.* 3: 56 (1867).	*In quadam parte Australiae haud indicata detexit Dr. Ludw. Leichhardt.*	MEL
Najadaceae *Najas leichhardtii* Magnus, *Beitrage zur Kenntniss der Gattung Najas L.*: 46, 50,52, t. 8, figs 1-8 (1870).	*bei einer von Leichhardt in Australien gesammelten Pflanze*	K
Phallaceae *Aseroe actinobola* Corda, *Icones Fung. cogn* .6: 23 (1854) = *Aseroe rubra* Labill., *Novae Hollandiae Plantarum Specimen* 2: 124 (1806).	*Mr. Leichardt theilte die Zeichnung und Beschreibung des frischen und so merkwürdigen Pilzes folgends mit*	K
Poaceae *Aristida leichhardtiana* Domin, *Regni Veg.* 9: 551 (1911)	*Queensland: Dry-beef Creek, coll. Leichhardt.*	BRI
Poaceae *Aristida vagans* var. *gracillima* Benth., *Fl. Austral.* 7: 563 (1878) = *Aristida gracilipes* (Domin) Henrad, *Med. Rijks-Herb* 54: 209 (1926)	*Cameroons Brush, Leichhardt*	BRI
Poaceae *Festuca latispicea* F.Muell., *Fragm.* 8: 127 (1874) = *Glyceria latispicea* (F.Muell.) Benth., *Fl. Austral.* 7: 658 (1878)	*Ad Gwydir et Myall-Creek, Leichhardt*	MEL
Poaceae *Festuca loliiformis* F.Muell., *Fragm.* 8: 128 (1874) = *Tripogon loliiformis* (F.Muell.) C.E. Hubb., *Bull. Misc. Inform.* 10: 448 (1934)	*Ad Moreton's Bay et Charley's Creek, Leichhardt*	cited but not located[not at K or BM]
Poaceae *Panicum buncei* F.Muell. ex Benth., *Fl. Austral.* 7: 487 (1878)	*Queensland. Bokhara Flats, Leichhardt*	K, BRI
Poaceae *Sporobolus caroli* Mez, *Repert. Spec. Regi. Veg.* 299 (1921)	*Australien, Liverpool-plains (Herb. hort. Sydney)*	MEL
Pontederiaceae *Limnostachys cyanea* F.Muell., *Fragm.* 1: 24 (1858) = *Monochoria cyanea* (F.Muell.) F.Muell., *Fragm.* 8: 44 (1873)	*In terra Arnhem's Land. Leichhardt*	K, MEL
Proteaceae *Grevillea leichardtii* S.Moore, *J. Linn. Soc. Bot.* 45: 211 (1920) = *Grevillea pungens* R.Br., *Trans. Linn. Soc. London* 10: 175 (1810)	*N. Australia, "Sandy scrubland west side of gulf" [Carpentaria]; Leichardt*	BM, K, MEL
Proteaceae *Grevillea leiophylla* F.Muell. ex Benth., *Fl. Austral.* 5: 471 (1870).	*Queensland. Glasshouse ranges, Moreton Bay, F.Mueller, and probably the same neighbourhood, Leichhardt*	MEL, NSW
Proteaceae *Grevillea rubicunda* S.Moore, *J. Linn. Soc. Bot.* 45: 210 (1920)	*N. Australia, "Westward of the Gulf [Carpentaria], table-land of the South Alligator"; Leichardt*	BM

Appendix (continued)

Proteaceae *Grevillea singuliflora* F.Muell., *Fragm.* 6: 92 (1867)	*Ad rivum Dogwood-Creek Dogwood Creek, Leichhardt*	BM, MEL
Proteaceae *Lomatia silaifolia* var. *induta* F.Muell. ex Benth., *Fl. Austral.* 5: 537 (1870) = *Lomatia silaifolia* var. *silaifolia* (Sm.) R.Br., *Trans. Linn. Soc. London* 10: 199 (1810)	*Brisbane river, Moreton Bay, Leichhardt, F. Mueller*	BM, K
Ranunculaceae *Clematis aristata* var. *leichhardtiana* Kuntze, *Verh. Bot. Vereins Prov. Brandenburg* 26: 156 (1885)	*Australia (!1842 Leichhardt, mus. bot. berol.); Norfolk Island; Lord Howe's Island; Nova Caledonia (!Gillivray)*	cited but not located[not at K or BM]
Rhamnaceae *Emmenosperma alphitonioides* F.Muell., *Fragm.* 3: 63 (1862)	*ad amnem Piri Creek; Dr Ludw. Leichhardt*	cited but not located[not at K or BM]
RosaceaeRubus moorei F.Muell. var. leichhardtianus Domin, Regni. Veg. 1133 (1913) = Rubus moorei F.Muell. var. moorei	*New South Wales: From the Creek Brush to Archers Station, leg. Leichhardt*	MEL
RubiaceaeAsperula geminifolia F.Muell., Fragm. 5: 147 (1899)	*In pratis ripariis inter flumina Dawson's River et Brisbane's River; Leichhardt, F.M.; nec non prope urbem Newcastle, Leichhardt*	cited but not located[not at K or BM]
RutaceaeEriostemon leichardtii F.Muell. Fragm. 5: 5 (1866) = Halfordia kendack (Montrouz.) Guillaumin, Notulae Systematicae (Paris) 98 (1911)	*Secus rivos silvaticos in vicinia sinus marini Moreton Bay. Dr. Ludw. Leichhardt*	MEL
Rutaceae *Eriostemon trachyphyllus* var. *leichhardtii* Benth., *Fl. Austral.* 1: 333 (1863) =*Philotheca glasshousiensis* (Domin.) P.I.Forst., *Austrobaileya* 7: 178 (2005)	*"From Brroa" (N.S.Wales?) Leichhardt*	MEL
Rutaceae *Flindersia leichardtii* C.DC., *Monographic Phanerogamarum* 1: 731 (1878) = *Flindersia bennettiana* Benth., *Fl. Austral.* 1: 389 (1863)	*In Moreton Bay (Leichardt in herb. Mus. Par.)*	P
Santalaceae *Choretrum candollei* F.Muell. ex Benth., *Fl. Austral.* 6: 219 (1873)	*N.S.Wales. Liverpool plains, Leichhardt*	MEL
Sapindaceae *Euphoria leichhardtii* Benth. var. *hebepetala* Benth., *Fl. Austral.* 1: 468 (1863) = *Arytera foveolata* F.Muell., *Trans. & Proc. Philos. Instit. Vic.* 3: 24 (1859)	*"Nurrum Nurrum", Leichhardt (Herb. F.Muell.)*	MEL
Sapindaceae *Euphoria leichhardtii* Benth. *Fl. Austral.* 1: 468 (1863) = *Dimocarpus longan* Lour., *Fl. Cochin.* 233 (1790)	*Queensland (?), Leichhardt (Herb. F. Muell.).*	MEL
Sapindaceae *Harpullia leichhardtii* F.Muell. ex Benth., *Fl. Austral.* 1: 470 (1863)	*N.Australia. Port Essington, Leichhardt*	MEL

Appendix (continued)

Simaroubaceae *Ailanthus punctata* F.Muell., *Fragm.* 3:42 (1863] = *Pentaceras australis* (F.Muell.) Benth., [Rutaceae] *Fl. Austral.* 1:365 (1863)	*in silvis Australiae orientalis subtropicae; e.g. MacConnell's Brush, L. Leichhardt*	cited but not located[not at K or BM]
Solanaceae *Anthocercis leichhardtii* F.Muell., *Fragm.* 6: 142 (1868) = *Duboisia leichhardtii* (F.Muell.) F.Muell., *Syst. Census Austral.* Pl. 97 (1883)	*In Australia orientali extratropica; Leichhardt*	K, MEL
Sterculiaceae *Commersonia leichhardtii* Benth., *Fl. Austral.* 1:242 (1863)	*Queensland. Head of Boyd river, Leichhardt, in Herb. F. Muell.*	MEL
Stereaceae *Thelephora leichhardtiana* Lev., *Ann. Sci. Nat.* ser.3, 5: 148 (1846) = *Stereum ostrea* Blume & Nees, *Epicr. Syst. Mycol.* 547 (1838)	*Queensland.*	K
Urticaceae *Hyrtanandra lythroides* F.Muell., *Fragm.* 5: 194 (1866) = *Pouzolzia hirta* (Blume) Hassk., *Cat. Hort. Bogor* 800 (1844)	*Ad flumen Lynd's River ejus originem versus, nec non ad fluvium South Alligator-River in terra tabulari; Dr. Leichhardt.*	cited but not located[not at K or BM]
Urticaceae *Elatostema reticulatum* Wedd., *Ann. Sci. Nat. Bot.* ser. 4, 1: 188 (1854)	*Nov. Holland. (Leichhard, pl. exs., n.?).*	NSW
Urticaceae *Urera leichardiana* Wedd., *Ann. Sci. Nat.* ser 4, 1: 178 (1854) = *Dendrocnide photinophylla* (Kunth) Chew, *Gard. Bull. Singapore* 21: 205 (1965)	*Nov. Holland. (Leichard, pl. exs. n. 26).*	P
Urticaceae *Urera excelsa* Wedd., *Ann. Sci. Nat.* ser 4, 1: 178 (1854) = *Dendrocnide excelsa* (Wedd.) Chew, *Gard. Bull. Singapore* 21: 205 (1965)	*Nova Hollandia (Leichhard, pl. exs. n. 17).*	P
Verbenaceae *Vitex leichhardtii* F.Muell., *Fragm.* 3: 58 (1862) = *Gmelina leichhardtii* (F.Muell.) Benth., *Fl. Austral.* 5: 66 (1870).	*In silvis ad amnem Myall Creek Australiae orientalis subtropicae; Dr. Ludwig Leichhardt.*	MEL
Zygophyllaceae *Tribulus minutus* Leichh. ex Benth., *Fl. Austral.* 1:291 (1863)	*Queensland (?), Leichhardt's Expedition.*	K, MEL, NSW

Wing structure in seeds of *Strangea* Meisn. and *Stenocarpus* R.Br. (Proteaceae)

H. Trevor Clifford[1] and Mary E. Dettmann[2]

Summary

Clifford, H.T. & Dettman, M.E. (2005). Wing structure in seeds of *Strangea* Meisn. and *Stenocarpus* R.Br. (Proteaceae). *Austrobaileya* 7(1): 165–170. In *Stenocarpus* the inner wing of the seed derives from the mesophyll of the outer integument whereas with *Strangea* this wing develops from the inner epidermis of that integument. The outer wing in both genera derives from the outer epidermis of the outer integument. Contrary to the present circumscription of the Subtribe *Stenocarpinae* in neither genus is the inner integument involved in wing production. An emended diagnosis for the Subtribe *Stenocarpinae* is provided.

Key Words: Proteaceae, *Stenocarpus, Strangea*, seed morphology, subtribe *Stenocarpinae*

[1]H.T.Clifford, c/o Queensland Herbarium, Environmental Protection Agency, Brisbane Botanic Gardens, Mt Coot-tha Rd, Toowong, Queensland 4067, Australia

[2]M.E.Dettman, School of Integrative Biology, University of Queensland, Queensland 4072, Australia

Introduction

Strangea Meisn. and *Stenocarpus* R.Br. (Proteaceae) constitute the Subtribe *Stenocarpinae* L.A.S.Johnson & B.G.Briggs, within the Tribe *Embothrieae* Rchb. as defined by Johnson and Briggs (1975). The Subtribe is distinguished from the others of the *Embothrieae* in possessing, amongst other attributes, seeds with "2 adjacent wings; outer developed from the proximal part of the funicle and folded around the inner wing which is developed from the inner integument". Douglas (1995) stated that the *Stenocarpinae* "possess a fasciculate wheel-like or 1-flowered inflorescence and a distinctive interseminal layer". As shown below in neither genus is the inner wing derived from the inner integument.

The seed coats of these and other genera of Proteaceae are formed from the outer integument and the basal tissues of the ovule, so the seed is extotestal (Netolitzky 1926, Corner 1976, Manning & Brits 1993). The 'crystal layer' identified in the seeds of many genera develops from the inner epidermis of the outer integument (Corner 1976, Kausik 1940, Manning & Brits 1993, Netolitzky 1926, Strohschen 1986a,b,c) and is one cell thick. In the majority of these cells a single crystal and/or sand of calcium oxalate is present (Jordaan 1946a,b, Strohschen 1986a,b,c). Due to the breakdown of the inner integument the embryo sheath is formed largely from two cuticles. The outer forms between the two integuments and the inner between the inner epidermis of the inner integument and the nucellus (Strohschen 1986a,b,c). The embryo sheath is sac-like and envelops all tissues that lie within the outer cuticle and is usually stained with tannin especially about the hypostase. On account of its shape it is unfortunate the term embryo sac is not available for this structure.

In the current paper we describe the seed morphology of *Strangea* and *Stenocarpus* and provide an emended diagnosis for the tribe *Stenocarpinae*.

Materials and methods

The seeds and fruits of *Strangea linearis* (Voucher: *Dettmann s.n.* [AQ751259]) were collected from *Banksia aemula–Eucalyptus signata* woodland on North Stradbroke Island and those of *Stenocarpus sinuatus* (Louden) Endl. (Voucher: *Clifford s.n.* [AQ751257]) and *Stenocarpus salignus* (Voucher: *Clifford s.n.* [AQ751258]) from trees cultivated in Brisbane. Voucher specimens have been deposited in the Queensland Herbarium.

The structure of the seed wings was determined from a study of ovules and seeds

Accepted for publication 30 June 2005

made optically transparent by soaking in a dilute solution of commercial bleach and after rinsing thoroughly with water were stained with 1% safranin. They were mounted in glycerine jelly before examination in transmitted and reflected light at magnifications up to x200.

For purposes of comparison, the developing seed wings of several proteaceous genera, other than *Strangea* and *Stenocarpus*, were also investigated. These included *Banksia* L.f., *Buckinghamia* F.Muell., *Cardwellia* F.Muell., *Grevillea* R.Br. ex Knight, *Hakea* Schrad., *Lomatia* R.Br., *Orites* R.Br. and *Xylomelum* Sm.

Results

The seeds of both *Strangea* and *Stenocarpus* derive from ovules that are initially hemitropous but due to their differential growth and that of the follicle, the seeds, at maturity, may appear to be anatropous. This apparent change in the orientation of the ovule with age may result from the extension of the raphe relative to the distal portion of the ovule or from the anterior end of the sclereid strand being confused with the hilum (**Fig. 1**). The vascular trace in both genera is embedded in a strand of sclereids on the hilar side of the wing, but towards the base of the seed the strand reverses direction and, after passing through the tissue surrounded by the base of the outer integument, branches radially to form a radiating cap over the hypostase. On account of its change of direction the vascular trace assumes the form of a loop or sharp hook to which the name "hooked raphe" was given by Johnson & Briggs (1963).

Whereas the embryo is close to the chalazal region in the seeds of *Stenocarpus,* in *Strangea* it is quite distant therefrom (**Fig. 1**). This distinction between the genera was commented upon by Johnson & Briggs (1963) who noted that, "The most important difference lies in the downward projection of the vascular tissue in the chalazal region....".

The seeds of all species of *Strangea* are rectangular in outline and of those reported for

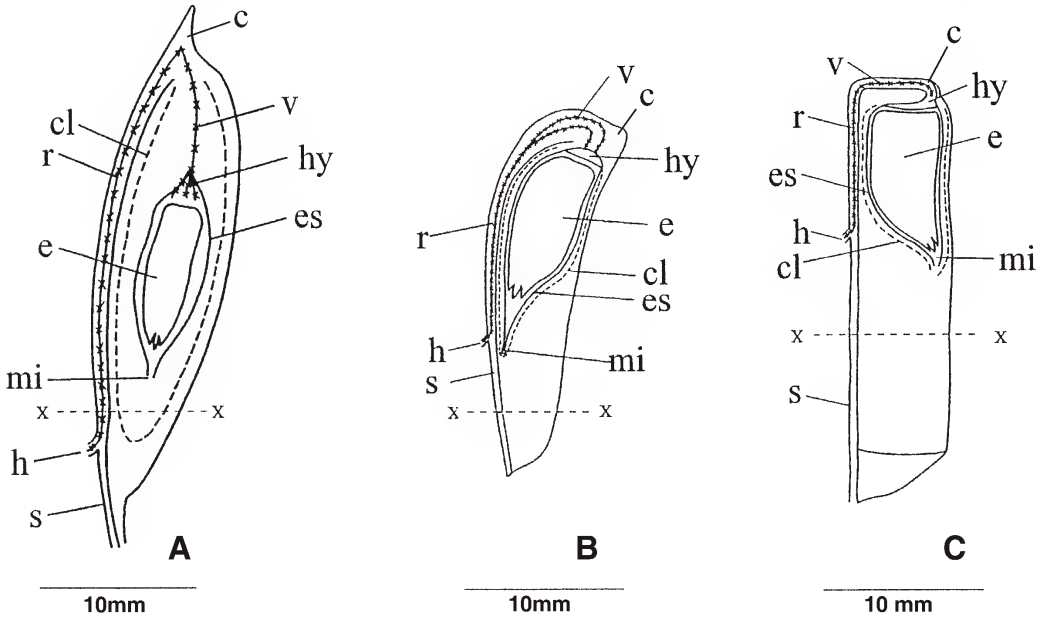


Fig.1. Longitudinal sections of mature seeds of *Strangea* and *Stenocarpus* species in the plane which includes the hilum, chalaza and micropyle , (diagrammatic and micropyle directed towards the base of the follicle). A. *Strangea linearis;* B. *Stenocarpus sinuatus;* C. *Stenocarpus salignus.*

Abbreviations: c, chalaza; cl, crystal layer; e, embryo; es, embryo sheath; h, hilum; hy, hypostase; me, mesophyll; mi, micropyle; oe, outer epidermis of outer integument; r, raphe; s, sclereid strand; v, vascular trace.

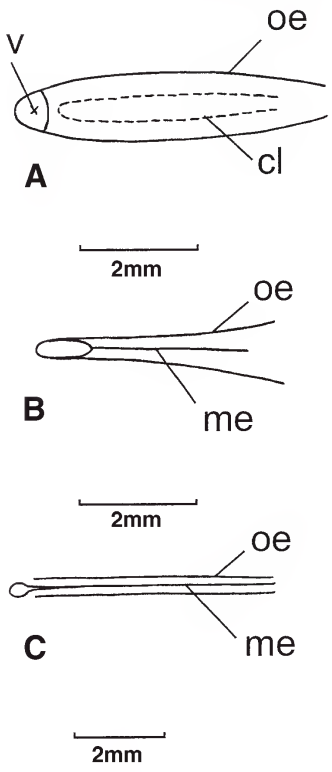


Fig. 2. Transverse sections of mature seed wings of *Strangea* and *Stenocarpus* species, (diagrammatic). A. *Strangea linearis*; B. *Stenocarpus sinuatus*; C. *Stenocarpus salignus.*

Stenocarpus they are either rectangular or sub-circular (Foreman 1995). All species of both genera are flattened in the plane that includes the micropyle, chalaza and hilum. In each genus the outer integument loosely invests the remainder of the seed in a membranous sheath. At maturity this splits longitudinally along the side opposite the hilum in all species of *Strangea* but in *Stenocarpus* splits across the apical end and the whole length of either the side opposite the hilum or along both sides of the sheath (**Fig. 2**).

With the seeds of *Strangea* the split penetrates the outer integument resulting in the formation of two membranous cloak-like open sheaths, commonly referred to as wings. The outer wing, which derives from the outer epidermis of the outer integument remains attached to the sclereid strand. Although separate from the inner wing it is folded along the line of the sclereid strand and is attached only at the chalaza. The inner wing is the crystalliferous inner epidermis of the same integument. The embryo and its enclosing sheath are suspended from the vascular trace that extends from behind the base of the outer integument to the hypostase (**Fig. 1A, 3A**) thereby resembling a seed on a long funicle and was so interpreted by Bailey (1913), Drummond (1853) and Gardner (1933,1942).

With the seeds of *Stenocarpus* the situation is more complex. Here the outer enveloping wing, as with *Strangea*, is formed from the outer epidermis of the outer integument but the inner develops from its mesophyll, a tissue not formed in *Strangea* seeds. The outer wing may split, as in *S. sinuatus,* from the base to the apex of the seed, along the side opposite the hilum, thereby forming a laterally compressed cowl-like sheath over the mesophyll as in *S. sinuatus*. In contrast, the outer epidermis of a *S. salignus* seed splits across its chalazal end and along both the hilum and non-hilum sides to produce two wing-like membranes (Maiden 1904, Schwartzbarth 1905), which are attached to a flap of tissue formed from the apex of the integument. On the hilum side of the seed a split develops on both sides of the sclereid strand. In both species the crystal layer (inner epidermis of the outer integument) immediately surrounds the embryo sheath to which it is tightly appressed. The mesophyll and outer epidermis (inner and outer wings) surround the crystal layer and are extended beyond the micropyle to form the apical half of the seed (**Fig. 3**).

Discussion

The origin of the two hinge-like wings surrounding the embryo sheath of *Strangea* seeds were misinterpreted by Gardner (1933, 1942) when he proposed *Diploptera* C.A.Gardner as a new genus to accommodate *Hakea stenocarpoides* Benth. Following Bailey (1913) and Drummond (1853) he regarded the wings as part of the fruit and the embryo sheath with its enclosed embryo as the seed. Later he appreciated that *Diploptera* and *Strangea* were congeneric (Gardner 1942). Initially *Strangea* was based on a single collection of *S. linearis*

Meisn., for which only one seed, "bordered on one side with a slightly thickened nerviform margin" (Meisner 1855, p.67), was available. As there was no mention of a wing the seed may have been immature. In the same paper Meisner described *Grevillea cynanchicarpa* Meisn. from Western Australia and although he was inclined to include it in *Strangea* did not do so because the specimen lacked seeds, the morphology of which he regarded as diagnostic of the genus.

However, the seeds had been described by Drummond (1853), the collector of the specimen, and Meisner quoted a portion of his description, after translating it into Latin. It read as follows "1-spermo, semine apice alato, samara *Fraxini* imitante". Unfortunately he left out the remainder of the sentence which read as follows, "each seed is enclosed by three membranous wings; the outer and inner are smooth and brown, not unlike the wings of the seed of *Hakea* and *Banksia* in substance; the middle membrane is of light brown colour and very brittle" (Drummond 1853, p.182). From one who possessed only a hand lens this description of the seed is amazingly accurate. Furthermore, in reporting that the middle wing, now known to be the crystal layer, is brittle, Drummond reveals he was exceptionally observant. Some years later Mueller (1871) transferred the species to *Strangea* and in an expanded description of the genus noted the seeds possessed two wings that were derived from the seed coat.

In the above account stress has been placed on the crystal layer for determining the structure of winged Proteaceae seeds, but Gardner (1933), when he described *Diploptera,* did not appear to have been aware of its taxonomic importance. At that date the presence of a crystal layer in some of these seed coats had been reported by Netolitzky (1926) who correctly placed the crystals in the inner epidermis of the outer integument. In the non-winged seeds of M*acadamia* F.Muell. a crystal layer had also been reported by Francis (1928) who incorrectly interpreted it as being the inner integument. Unaware that in some taxa of Proteoideae the outer integument and pericarp are fused, Filla (1926) regarded the crystal layer of *Serruria* Adans. *emend.* Salisb. seeds as part of the inner fruit wall. Although Brough (1933) described in detail both the anatomical and the morphological development of *Grevillea robusta* R.Br. seeds he did not report the presence of crystals in the inner epidermis of the outer integument. Not until the studies of Jordaan (1946a,b) was the taxonomic

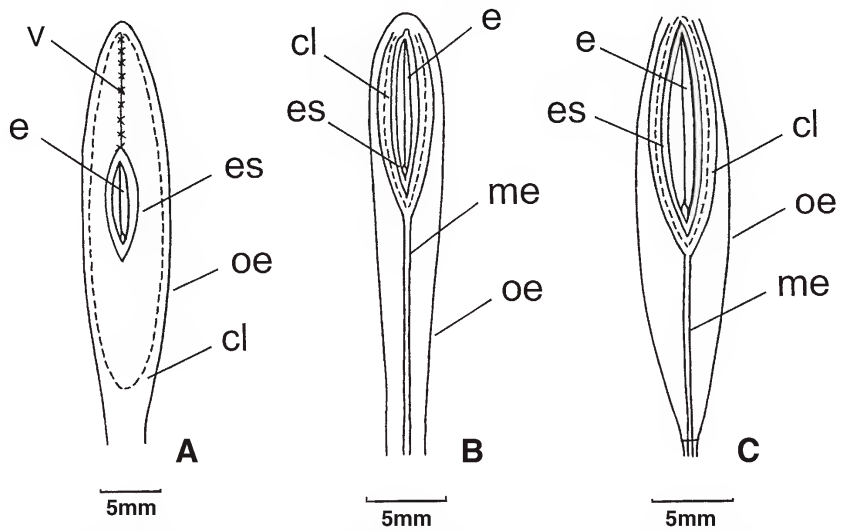


Fig. 3. Longitudinal section of mature seeds of *Strangea* and *Stenocarpus* species in the plane at right angles to that in Fig.1 (diagrammatic). A. *Strangea linearis;* B. *Stenocarpus sinuatus;* C. *Stenocarpus saligna*. Abbreviations as listed in Legend to Fig. 1.

All sections taken at level x——x of Fig. 1. Abbreviations as listed in Legend to Fig. 1.

significance of the crystal layer appreciated. Although the structure of the seed-wings of *Strangea* and *Stenocarpus* are not identical, in neither genus is the inner integument involved in their formation as claimed by Johnson and Briggs (1975) and *Flora of Australia* 16: 360 (1995), so the following emended diagnosis of the Subtribe *Stenocarpinae* is proposed:

Proteaceae, Subtribe **Stenocarpinae** L.A.S. Johnson & B.G. Briggs *emend.* H.T.Clifford & M.E.Dettmann

Conflorescentia fasciculiformis vel rotata vel floribus paucis aliquando unico; flores ± zygomorphi; ovula 1–2 vel 2 usque ad numerosa; semina 1 vel multa duo et alata. Chromosomata *n*=11. Genus typicum: *Stenocarpus* R.Br.

Conflorescence of fascicles or wheel-like or flowers few, sometimes solitary; flowers ± zygomorphic; ovules 1–2 or 2–many; seeds 1-several, two-winged.

Acknowledgements

The assistance of Natalie Camilleri in preparing the diagrams is much appreciated. The authors are also indebted to the Curator, Ross McKinnon AM, for permission to collect living material from the Brisbane Botanic Garden, Mt Coot-tha, Dr Paula Rudall of the Royal Botanic Gardens, Kew for providing literature and an unnamed referee for helpful comments on the original manuscript.

References

Bailey, F.M. (1913). *Comprehensive Catalogue of Queensland Plants*. Government Printer: Brisbane.

Brough, P. (1933). The life-history of *Grevillea robusta* [Cunn.]. *The Proceedings of the Linnean Society of New South Wales* 58: 33–73.

Corner, E.J.H. (1976). *The seeds of Dicotyledons*. Cambridge University Press: Cambridge.

Douglas, A.W. (1995). Affinities. In P. McCarthy (ed.), *Flora of Australia* 16, Elaeagnaceae, Proteaceae 1: 6–14. CSIRO Australia: Melbourne.

Drummond, J. (1853). On the botany of the north western District of Western Australia. *Hooker's Journal of Botany and Kew Garden Miscellany* 5: 177–183.

Filla, F. (1926). Das Perikarp der Proteaceae. *Flora* 120: 99–142.

Forman, D.B. (1995). *Stenocarpus*. In P.McCarthy (ed.), *Flora of Australia* 16, *Elaegnaceae, Proteaceae* 1:363-369. CSIRO Australia: Melbourne.

Francis, W.D. (1928). The anatomy of the Australian bush nut (*Macadamia ternifolia*). *Proceedings of the Royal Society of Queensland* 39: 43–52, + plate 1.

Gardner, G.A. (1933). Contributiones florae australiae occidentalis No. VIII. *Journal of the Royal Society of Western Australia* 19: 79–93.

Gardner, G.A. (1942). Contributiones florae australiae occidentalis No.XI. *Journal of the Royal Society of Western Australia* 27: 165–210.

Johnson, L.A.S. & Briggs, B.G. (1963). Evolution in the Proteaceae. *Australian Journal of Botany* 11: 21–61.

Johnson, L.A.S. & Briggs, B.G. (1975). On the Proteaceae – the evolution and classification of a southern family. *Botanical Journal of the Linnean Society* 70: 83–182.

Johnson, L.A.S. & Briggs, B.G. (1995). *Flora of Australia* 16, Elaeagnaceae, Proteaceae 1. CSIRO Australia: Melbourne.

Jordaan, P.G. (1946a). Die Saadknop en Embriologie van Leucadendron (with Summary in English). *Annale van die Universiteit van Stellenbosch.* Jaargang XXIII, Reeks A, No.7 (1945): 1–38.

——— (1946b). Die Saadknop en Embriologie van *Leucospermum conocarpum* R.Br. (with Summary in English). *Annale van die Universitiet van Stellenbosch.* Jahrgang XXIII, Reeks A, No.7 (1945): 39–53.

Kausik, S.B. (1940). Studies in the Proteaceae. IV. Structure and Development of the Ovule of *Hakea saligna* Knight. *Annals of Botany* (n.s.) 4: 73–80.

Maiden, J.H. (1904). *The Forest Flora of New South* Wales. Part VI. No. 22. Government Printer: Sydney.

Manning, J.C. & Brits, G.J. (1993). Seed coat development in *Leucospermum cordifolium* (Knight) Fourcade (Proteaceae) and seed covering structures in Proteaceae. *Botanical Journal of the Linnean Society* 112: 139–148.

Meisner, C.F. (1855). New Proteaceae of Australia. *Hooker's Journal of Botany and Kew Miscellany* 7: 65–78.

Mueller, F. (1871). *Fragmenta Phytographie australiae* 7: 131–133. Government Printer: Melbourne.

NETOLITZKY, F. (1926). Anatomie der Angiospermen-Samen. In K.Linsbauer (ed.), *Handbuch der Pflanzenanatomie* 10: 364–67. Gebruder Borntraeger: Berlin.

SCHWARTZBARTH, J. (1905). Anatomische Untersuchungen von Proteaceen-Fruchten und Samen. *Beihefte zum Botanischen Centralblatt* 18: 27–78.

STROHSCHEN, B. (1986a). Contributions to the biology of useful plants. 4. Anatomical studies of fruit development of the Macadamia Nut (*Macadamia integrifolia* Maiden and Betche). *Angewandte Botanik* 60: 239–247.

STROHSCHEN, B. (1986b). Contributions to the biology of useful plants. 5. Anatomical studies of fruit development and fruit classification of the Monkey Nut (*Hicksbeachia pinnatifolia* F.Muell.). *Angewandte botanik* 60: 249–256.

STROHSCHEN, B. (1986c). Contributions to the biology of useful plants. 6. Anatomical studies of fruit development and fruit classification of *Persoonia pinifolia* R.Br. *Angewandte Botanik* 60: 251–265.

The rediscovery of *Boronia inflexa* subsp. *grandiflora* (Rutaceae)

Marco F. Duretto[1], Paul Grimshaw[2] & Kym Sparshott[3]

Summary

Duretto, M.F., Grimshaw, P. & Sparshott, K. (2005). The rediscovery of *Boronia inflexa* subsp. *grandiflora* (Rutaceae). *Austrobaileya* 7(1): 171–173. Details of the first collection of *Boronia inflexa* Duretto subsp. *grandiflora* Duretto with accurate site and habitat information are presented. The descriptions for the species and subspecies are revised and an amended key to the subspecies of *B. inflexa* is provided. The habitat of the *B. inflexa* subsp. *grandiflora* is discussed for the first time and it is recommended that the conservation status of the subspecies be revised to 'Critically Endangered'.

Key Words: Rutaceae, *Boronia inflexa, Boronia inflexa* subsp. *grandiflora,* Queensland flora

[1]M.F. Duretto, Tasmanian Herbarium, Tasmanian Museum and Art Gallery, Private Bag 4, Hobart, Tasmania 7001, Australia. Email: marco.duretto@tmag.tas.gov.au.

[2]P. Grimshaw, Biodiversity Assessment and Management Pty Ltd, 38 Middle St, Cleveland, Queensland 4163, Australia. Email: paul@biodiversity.tv.

[3]K. Sparshott, Queensland Parks and Wildlife Service, Park Services, Southern Region, Toowoomba District Office, PO Box 731, Toowoomba, Queensland 4350, Australia. Email: kym.sparshott@epa.qld.gov.au.

Introduction

Boronia inflexa Duretto subsp. *grandiflora* Duretto was described in a revision of *Boronia* section *Cyanothamnus* for eastern Australia (Duretto 2003). This taxon was first identified by Ross (1983) as a large-flowered form of *B. bipinnata* from the Granite Belt of south-eastern Queensland. It may have been part of what was referred to by McDonald *et al.* (1995) as *B.* sp. aff. *bipinnata* in their *Flora of Girraween and Bald Rock National Parks*. *Boronia inflexa* contains four subspecies, two of which have large flowers: *B. inflexa* subsp. *grandiflora* (Qld) and *B. inflexa* subsp. *torringtonensis* Duretto (N.S.W.). The other two subspecies, *B. inflexa* subsp. *inflexa* and *B. inflexa* subsp. *montiazura* Duretto, have smaller flowers and are both found in the 'granite belt' of south-eastern Queensland. The former is also known from an isolated population in Gibraltar Range (N.S.W.).

In the discussion under *B. inflexa* subsp. *grandiflora,* Duretto (2003) noted that the taxon was known from two collections with vague collection details. As these collections were from the western edge of the known distribution of *B. inflexa* subsp. *inflexa* there was the possibility that these two taxa were not taxonomically distinct but represented extremes in flower size. Given that *B. inflexa* subsp. *grandiflora* is a large flowered and showy taxon and thus would tend to be noticed, the lack of collections since 1973 indicated that it was possibly extinct.

During surveys of the north-west portion of Girraween National Park in November 2000, two of the authors (Grimshaw & Sparshott) collected material of a large flowered taxon which had affinities to *B. bipinnata.* This material was made available to Duretto in late 2003 who determined that the material could be assigned to *B. inflexa* subsp. *grandiflora.* The type locality of this taxon is 'property of W. McDonagh, Lyra' which is close to where the recent collection was made in Girraween National Park. It would be reasonable to suppose that these two collections have come from the same population.

Revised descriptions for *B. inflexa* and *B. inflexa* subsp. *grandiflora* are given below, together with the first account of the habit and habitat of the latter. The revised descriptions have necessitated minor amendments of the key to the subspecies of *B. inflexa* as published by Duretto (2003).

Accepted for publication 30 June 2005

Taxonomy

Boronia inflexa Duretto, *Muelleria* 17: 40, figs 2I-K (2003). **Type:** Queensland. Darling Downs District: Mt Norman, Girraween National Park, 28° 52'S 151° 58'E, 27 September 1977, *J. Armstrong 1149 & J.M. Powell* (holo: BRI [AQ383403]; iso: CANB 8305848, NSW 385918).

Erect, woody shrub to 2 m tall and 3 m wide. Branchlets not or slightly glandular tuberculate, hispidulous or pilose; hairs concentrated between leaf decurrencies, becoming glabrous with age, hairs to 0.5(–0.75) mm long. Leaves imparipinnate or rarely bipinnate (subsp. *inflexa*), 3–5(–7)-foliolate, entire leaf in outline 6–25 mm long, 6–35 mm wide, not obviously glandular, glabrous to minutely pilose; petiole 3–10 mm long; rachis segments 3–9 mm long; terminal leaflets 1–16 mm long, 0.5–2.5 mm wide, linear, flat, concolorous, dorsiventral, margin entire, tip acute; lateral leaflets similar to terminal leaflets or longer, 1.5–16 mm long. Inflorescence 1–3(–7)-flowered, not obviously glandular, glabrous or glabrescent, smaller to slightly longer than leaves; peduncles 0.5–9 mm long, secondary inflorescence units 0.5–1 mm long; prophylls 0.5–3 mm long, glabrous or glabrescent with a few hairs towards apex or minutely ciliate; metaxyphylls 0.5–1.5 mm long; anthopodia 1–3 mm long. Sepals deltate to narrowly deltate, 1.5–3 mm long, 0.75–1.5 mm wide, not obviously glandular, flat, glabrous to minutely ciliate, tip acute or acuminate due to involute margins. Petals white to pink, 2.5–7.5 mm long, not obviously glandular, glabrous to minutely ciliate, persistent. Staminal filaments pilose, slightly glandular tuberculate towards apex; anther loculi glabrous, apiculum minute, glabrous to pilose. Ovary glabrous; style glabrescent to pilose; stigma entire, minute, scarcely wider than the style. Cocci 3–3.5 mm long, 1–2 mm wide, glabrous or with few hairs along suture. Seed dull, grey, 2.5–3 mm long, 1–1.5 mm wide, irregularly rugulose, without wax platelets between tubercula.

***Conservation status*:** Three of the four subspecies of *B. inflexa,* namely *B. inflexa* subsp. *grandiflora*, *B. inflexa* subsp. *montiazura* and *B. inflexa* subsp. *torringtonensis*, can be considered Critically Endangered (IUCN 2001) though the last two lack satisfactory field data. *B. inflexa* subsp. *inflexa* is found over a wider area but accurate population sizes are unknown. Populations seen in Gibraltar National Park (see Duretto 2003) and Girraween National Park (Grimshaw pers obs.) contained few plants.

Given that populations appear to be small and occur over very limited areas, the species as a whole, could be considered to be Critically Endangered. Only *B. inflexa* subsp. *inflexa* and *B. inflexa* subsp. *grandiflora* are conserved in National Parks.

Key to the subspecies of *Boronia inflexa*

1. Leaflets minutely pilose 2
   Leaflets glabrous or glabrescent 3

2. Petals 2–3.5 mm long; anther apiculum glabrous . . . . . subsp. **inflexa**
   Petals 6–7.5 mm long; anther apiculum with a few hairs . . . . . subsp. **grandiflora**

3. Terminal leaflets 3–7 mm long, 0.5–0.75 mm wide . . . . . subsp. **montiazura**
   Terminal leaflets (4–)10–16 mm long, (0.75–)1–1.25 mm wide . . . . . subsp. **torringtonensis**

Boronia inflexa subsp. **grandiflora** Duretto, *Muelleria* 17: 43, figs 2 N-O (2003). **Type**: Queensland. Darling Downs District: On property of W.McDonagh, Lyra, Qld, 22 October 1962, *K.N. Shea S124* (holo: BRI [AQ151006], transparency MEL 2068529).

Shrub to c. 1.5 m tall. Branchlets not glandular tuberculate, pilose, mainly between leaf decurrencies, hairs to 0.5(–0.75) mm long. Leaves imparipinnate, 3(–7)-foliolate, entire leaf in outline (9–) 15–25 mm long, (8–) 17–35 mm wide, sparsely and minutely pilose; petiole 4–10 mm long; rachis segments 3–9 mm long; leaflets 4–15 mm long, 0.75–1.25 mm wide. Inflorescence axillary, 1–3-flowered, smaller or

c. as long as leaves; peduncles 2–7 mm long; prophylls 1–3 mm long, ciliate towards apex; anthopodia 1.5–3 mm long. Sepals deltate, 2–3 mm long, 1.25–1.5 mm wide, glabrescent along margin and/or towards apex, tip acuminate due to involute margins. Petals pale pink and tinged with white, 6–7.5 mm long, minutely ciliate. Anther apicula with a few simple hairs. Style pilose. Cocci and seed not seen.

***Specimens examined*: Queensland.** DARLING DOWNS DISTRICT: Near Amiens, SE Qld, Sep 1973, *Harslett s.n.* (NE2638 [transparencies BRI, MEL 2068530]); NW section of Girraween NP near Lyra, Dec 2000, *Grimshaw PG2857 & Sparshott* (BRI, NSW).

***Distribution and ecology*:** The only known extant population of *B. inflexa* subsp. *grandiflora* is found in Girraween National Park on the Granite Belt of southeast Queensland. The two older known collections give imprecise locality information of near Amiens and Lyra, also in the Granite Belt. The population in Girraween National Park was found in *Eucalyptus prava*, *E. andrewsii* and *E. caleyi* woodland with a dense, shrubby and fairly diverse understorey. Scattered throughout the area are granitic pavements and outcrops. Flowering material has been collected from September to December.

***Conservation status*:** Duretto (2003) indicated that a conservation code of 2K (following the format of Briggs & Leigh 1996) was appropriate for *B. inflexa* subsp. *grandiflora* as only two collections with vague locality information were known. The third collection of this taxon (*Grimshaw PG2857 & Sparshott*) has precise locality and habitat information and was recently made within Girraween National Park. The taxon was seen in only one valley during a survey of the area (Grimshaw & Sparshott, pers. obs.) and approximately a dozen mature plants were seen over an area of 1–2 hectares. The site was burnt in October 2002 (Sparshott, pers. obs.) although it is not known how the population was affected. One of the authors (Grimshaw) has travelled extensively in the park over many years (in part as a park ranger between 1973 and 1982) and has not observed it elsewhere. Given this additional information, conservation codes of 2ECt (following Briggs & Leigh 1996), or CR (Critically Endangered; IUCN 2001) are appropriate. The taxon satisfies Critically Endangered criterion D [Population size estimated to number fewer than 50 mature individuals] of the IUCN Red List. Potential threats to the taxon's survival would include wildfires (especially if these occurred too frequently), any development [including roads, fire trails and walking tracks] in the area, and weed incursions. Further surveys are urgently required to determine if there are any other populations of this taxon, as is monitoring of the only known population.

Acknowledgements

The authors would like to thank Gintaras Kantvilas (HO) and an anonymous reviewer who made useful comments on an earlier draft of this manuscript.

References

IUCN (2001). *IUCN Red List Categories and Criteria: version 3.1.* IUCN Species Survival Commission. IUCN: Gland, Switzerland/ Cambridge, UK.

BRIGGS, J.D. & LEIGH, J.H. (1996). *Rare or Threatened Australian Plants*, revised edition. CSIRO Australia: Collingwood.

DURETTO, M.F. (2003). Notes on *Boronia* (Rutaceae) in eastern and northern Australia. *Muelleria* 17: 19–135.

MCDONALD, B., GRAVATT, C., GRIMSHAW, P. & WILLIAMS, J. (1995). *The Flora of Girraween and Bald Rock National Parks.* Queensland Herbarium, Queensland Department of Environment and Heritage: Brisbane.

ROSS, E.M. (1983). Rutaceae. In T.D. Stanley & E.M. Ross (eds), *Flora of South-eastern Queensland* 1: 440–470. Queensland Department of Primary Industries miscellaneous publication 81020: Brisbane.

New species of *Philotheca* Rudge (Rutaceae) from Queensland

Paul I. Forster

Summary

Forster, P.I. (2005). New species of *Philotheca* Rudge (Rutaceae) from Queensland. *Austrobaileya* 7(1): 175–181. Taxa previously allocated subspecies rank under *Philotheca myoporoides* are elevated to species rank as *P. conduplicata* (Paul G. Wilson) P.I.Forst., *P. epilosa* (Paul G. Wilson) P.I.Forst., *P. glasshousiensis* (Domin) P.I.Forst., *P. obovatifolia* (Bayly) P.I.Forst. and *P. queenslandica* (C.T.White) P.I.Forst. Diagnostic descriptions and a key are provided to the Queensland species of *Philotheca* section *Erionema* (F.Muell.) Paul G. Wilson.

Key Words: Rutaceae, taxonomy, *Philotheca conduplicata, Philotheca epilosa, Philotheca glasshousiensis, Philotheca myoporoides, Philotheca obovatifolia, Philotheca queenslandica,* Queensland flora

P.I. Forster, Queensland Herbarium, Environmental Protection Agency, Brisbane Botanic Gardens, Mt Coot-tha Road, Toowong, Queensland 4066, Australia. Email: paul.forster@epa.qld.gov.au

Introduction

The genus *Philotheca* Rudge with *c.* 50 species is endemic to Australia and was last revised by Bayly (1998) and Wilson (1998a). Six species of *Philotheca* in the two sections *P.* section *Philotheca* and *P.* section *Erionema* (F.Muell.) Paul G. Wilson have been recognised for Queensland (Wilson 1998a). *Philotheca acrolopha* Paul G. Wilson, *P. ciliata* Hook., *P. cuticularis* Paul G. Wilson, *P. difformis* (A.Cunn. ex Endl.) Paul G. Wilson and *P. sporadica* (Bayly) Paul G. Wilson belong to *P.* section *Philotheca* and *P. myoporoides s.lat.* to *P.* section *Erionema.*

Philotheca myoporoides (DC.) Bayly *s.lat.* was revised by Bayly (1998) who recognised one species with nine subspecies distributed in eastern Australia. Four of these subspecies are found in south-eastern Queensland. The rank at which taxa in *P. myoporoides s.lat.* have been recognised is based on the pioneering work of Wilson (1970) when he first revised the group (then part of *Eriostemon*). Wilson (1970) adopted a broad species concept of complex species with numerous phenetically defined subspecies in the genera *Eriostemon* and *Phebalium*. In recent times, recognition at species rank of some of these subspecific taxa, or other new taxa that might also have been named as subspecies when using the concepts of Wilson (1970, 1998a,b), has occurred in the genera *Leionema, Phebalium* and *Philotheca* (e.g. Rozefelds 2001; Forster 2003; Horton *et al.* 2004; Walsh 2004; Weston & Turton 2004). Bayly (1998) stated "for the most part, taxa in the *Philotheca myoporoides* complex are both morphologically and geographically distinct.....most taxa overlap on a number of these features, and each is largely defined by some unique combination of attributes".

As noted elsewhere (Forster 2005), it is considered that plant species can be defined as groups of populations (1-many) with discontinuities in the variation of two or more independent character states of morphology. It is assumed that there is genetic continuity or at least a shared ancestral lineage between the different populations of a single species, albeit in most cases in the absence of non-morphological data. Specific taxa defined in this manner are in the sense of the 'phenetic species concept' (Stebbins 1950; van Steenis 1957; Levin 1979, 2000; Cronquist 1988; Stuessy 1990). If only a single, or several minor (e.g. indumentum colour or density) character state differences are present and the discontinuity is geographically based, the rank of subspecies is often used. Subspecies should differ in only a few minor characters and *intermediate populations should exist to demonstrate continuity of character states* (e.g. Stebbins (1950) states "subspecies.... connected .... by a series of intergrading forms" or Stace (1989)

Accepted for publication 5 August 2005

states "a population of several biotypes forming a more or less distinct regional facies of a species ..... a geographical race, ecotype, topodeme or genoecodeme").

Neither Wilson (1970) nor Bayly (1998) have demonstrated that intermediate populations exist for the four subspecies of *P. myoporoides s.lat.* that occur in Queensland, either between the four subspecies, or between them and other subspecies in the superspecies. Weston & Harden's (2002) statement that "intergrades [are] known between taxa where they grow together" appears to not be based on any published data and may derive from Wilson's (1970) observation that there were "distinct morphological groups which occupy separate geographical areas (except at one point where two of them may overlap)". There are clear differences between the four subspecies based on habit, stem, leaf and staminal filament characters. Recognition of these four Queensland taxa at species rank is expedited here to enable use of the names in a forthcoming census of the Queensland flora. Two of the taxa have been previously recognised at species level in the genus *Eriostemon* (Domin 1926; White 1942). Revision of the remaining subspecies of *P. myoporoides s.lat.* in the states of New South Wales and Victoria is left in abeyance for workers familiar with the relevant taxa.

Materials and methods

The results in this paper are based on the examination of herbarium material at BRI, MEL and NSW. All taxa have been studied in the field. Although descriptions of the individual taxa can be sourced in Wilson (1970) and Bayly (1998); new, concise descriptions are provided below to assist in identification of the Queensland taxa.

Taxonomy

Key to the Queensland species of *Philotheca* section *Erionema* (F.Muell.) Paul G. Wilson

1. Stems sparsely to densely warty-verrucose 2
   Stems more or less smooth, or with only scattered, slightly raised glands 4

2. Leaves strongly concave when dry; staminal filaments eciliate or with only scattered long hairs towards the apex . . . . . **P. epilosa**
   Leaves ± flat or weakly concave when dry; staminal filaments ciliate for entire length and with dense long hairs towards the apex 3

3. Stems densely glandular-verrucose; leaves oblanceolate to oblong, 20–52 mm long × 5–11 mm wide, length/width ratio 3–5.7 . . . . . **P. glasshousiensis**
   Stems sparsely glandular-verrucose; leaves obovate, 28–60 mm long × (11–)15-28 mm wide, length/width ratio 2.2–3.3 . . . . . **P. obovatifolia**

4. Leaves elliptic, falcate and strongly conduplicate when dry, 30–65 mm long; petals 7–11 mm long; capsules 7–9 mm long . . . . . **P. conduplicata**
   Leaves narrow-elliptic to narrow-obovate, flat when dry, 7–30 mm long; petals 5–8 mm long; capsules 5–7 mm long . . . . . **P. queenslandica**

New Combinations

Philotheca conduplicata (Paul G. Wilson) P.I.Forst. **comb. & stat. nov.**; *Eriostemon myoporoides* subsp. *conduplicata* Paul G. Wilson, *Nuytsia* 1: 41 (1970); *Philotheca myoporoides* subsp. *conduplicata* (Paul G. Wilson) Bayly, *Muelleria* 11: 124 (1998).

Type: New South Wales. Howell, August 1905, *J.H. Maiden & J.L. Boorman s.n.* (holo: NSW68742).

***Illustrations*:** Williams (1984: 127), as *Eriostemon myoporoides* subsp.

conduplicatus; Bayly (1998: 114, fig. 1D) & Weston & Harden (2002: 297), as *Philotheca myoporoides* subsp. *conduplicata*.

Woody shrub to 2 m high; rootstock not rhizomatous. Branchlets ± smooth or with only scattered glands. Leaves laxly clustered near stem apices; leaf laminae narrow-elliptic, conduplicate and falcate when dry, 40–75 mm long, 6–14 mm wide, length/width ratio 4–10.4; apex obtuse to acute, mucronate; base attenuate. Inflorescences pedunculate to 4 mm, with 1–4 flowers; pedicels 2–4.5mm long, sparsely to densely glandular-verrucose. Petals elliptic-oblong to oblanceolate, 6–11 mm long, 2.5–3.5 mm wide, adaxially papillose, abaxially glabrous apart from scattered to dense, verrucose glands in the middle towards the apex, cream, sometimes with a pink tinge. Staminal filaments sparsely ciliate for entire length, apex sparsely pilose with hairs to 0.5 mm long. Cocci erect, prominently rostrate, 7–9 mm long.

***Selected specimens examined*: Queensland.** Darling Downs District: Glen Aplin, Jul 1949, *Althofer s.n.* (BRI [AQ151760]); Wyberba, Dec 1962, *Blake 22003* (BRI); near Wallangarra, Nov 1944, *Clemens s.n.* (BRI [AQ151759]); near Ballandean, Oct 1944, *Clemens s.n.* (BRI [AQ151763]); 3.3 km SE of Glen Aplin, Sep 1974, *Gittins 2793* (BRI); Daphne Peak, Braemar, Glen Aplin, Sep 1963, *Gordon 6404* (BRI); ridge S of Bald Mt, extreme W section of Girraween N.P., 28° 52'S, 151° 54'E, Sep 1994, *Grimshaw PG970 & Turpin* (BRI, NSW); 18 km SW of Stanthorpe, Portion 89, Nundubbermere Road, 28° 43'S, 151° 45'E, Oct 1994, *Halford Q2291* (BRI); Red Rock Gorge, Sundown N.P., Aug 1983, *Haselgrove SD57* (BRI); Fletcher, Mt Pleasant Fauna Sanctuary, Aug 1964, *Philp s.n.* (BRI [AQ151758]); Ballandean, Oct 1933, *White 9401* (BRI). **New South Wales.** Northern slopes of Bald Knob, 10 km Wof Woodenburg, 28° 22'S, 152° 32'E, Sep 1998, *Bean 13795* (BRI, NSW); WNW of Glen Innes via Wellingrove, Kings Plains N.P., 29° 34'S, 151° 22'E, *Coveny 16604 & Whalen* (BRI, NSW); Jonquil Knob, Torrington State Recreation area, off Duck Creek trail, 29° 11'S, 151° 32'E, Jul 2001, *Forster PIF27435* (BRI, MEL, NSW); Torrington, 29° 19'S, 151° 42'E, Oct 1969, *Jones 4115* (BRI).

***Distribution and habitat*:** *Philotheca conduplicata* is endemic to the Granite Belt of south-east Queensland (Girraween N.P., Sundown N.P., Ballandean, Glen Aplin) and adjacent north-east New South Wales (Bald Knob, Kings Plains N.P., Torrington). Plants grow in rocky areas on granite substrates at altitudes between 700 and 900 m.

***Notes*:** *Philotheca conduplicata* is distinctive in a combination of characters, *viz.* the leaves are laxly clustered at the stem apices and the laminae are narrow-elliptic, falcate and strongly conduplicate when dry. It is also the tallest of this group of Queensland species, with individuals up to 2 m observed.

Philotheca epilosa (Paul G. Wilson) P.I.Forst. **comb. & stat. nov.**; *Eriostemon myoporoides* subsp. *epilosus* Paul G. Wilson, *Nuytsia* 1: 41 (1970); *Philotheca myoporoides* subsp. *epilosa* (Paul G. Wilson) Bayly, *Muelleria* 11: 120 (1998). **Type:** Queensland. Darling Downs District: Wallangarra, November 1906, *S.L. Boorman s.n.* (holo: NSW69255; iso: NSW68741).

***Illustrations*:** Ross (1983: 466, fig. 71J) & Williams (1987: 119), as *Eriostemon myoporoides* subsp. *epilosus*; Bayly (1998: 114, fig. 1B) & Weston & Harden (2002: 296) as *Philotheca myoporoides* subsp. *epilosa*.

Woody subshrub to 1 m high; rootstock not rhizomatous. Branchlets densely glandular-verrucose. Leaves densely clustered near stem apices; leaf laminae obovate to oblanceolate, strongly concave when dry, 4–25 mm long, 2.2–8 mm wide, length/width 1.6–4.2; apex obtuse to rounded, strongly mucronate; base cuneate to truncate. Inflorescences pedunculate to 3 mm, with a solitary flower; pedicels 2–5 mm long, densely glandular-verrucose. Petals elliptic-oblong to obovate, 5–8 mm long, 2–3.5 mm wide, adaxially papillose, abaxially glabrous apart from scattered, verrucose glands in the middle towards the apex, cream, often tinged pink. Staminal filaments eciliate or only with scattered cilia for entire length, apex epilose or with only a few scattered hairs to 0.2 mm long. Cocci erect, prominently rostrate, 5–7 mm long.

***Selected specimens examined*: Queensland.** Darling Downs District: Wallangarra, Nov 1973, *Abell s.n.* (BRI [AQ13990]); Upper reaches of Bald Rock Creek, Girraween N.P., Sep 1993, *Bean 6369 & Forster* (BRI); Portion 90, Wyberba, near Girraween N.P., 28° 50'S, 151° 54'E, Sep 1993, *Bean 6383 & Forster* (BRI); Girraween N.P., Nov 1971, *Blake 23658* (BRI); Amiens, Nov 1956, *Bowen s.n.* (BRI [AQ151773]); Summit of Mt Norman, Wallangarra, Nov 1944, *Clemens 44562* (BRI); Signboard Mt, Girraween N.P., 28° 49'S, 151°

58'E, Aug 1995, *Forster PIF17582 & Figg* (BRI); Wyberba, 1961, *Hockings s.n.* (BRI [AQ151769]); Portion 125 Broadwater, N side of Girraween N.P., Aug 1974, *McDonald 264* (BRI); Stanthorpe, *s.dat., Macpherson s.n.* (BRI [AQ151772]); Amiens, at foot of "Sow & Pigs", Oct 1963, *Pedley 1485* (BRI); Property of W. McDonagh, Lyra, Oct 1962, *Shea S118* (BRI); Stanthorpe, Aug 1930, *Westcott 12* (BRI). **New South Wales.** Boonoo Boonoo N.P., NE of Tenterfield, near Boonoo Boonoo River, 28° 51'S, 152° 08'E, Sep 2001, *Copeland 3182* (BRI, MEL, NSW); 29 km N of Tenterfield off the Mt Lindesay Highway, Bungoona track to summit, Bald Rock N.P., 28° 51'S, 152° 02'E, Oct 1993, *Coveny 16563 & Whalen* (BRI, NSW); Bald Rock, Bald Rock N.P., 28° 51'S, 152° 02'E, May 1995, *Hunter 3202* (BRI, NE); 4 miles [6.4 km] NNE of Boonoo Boonoo, 28° 53'S, 152° 08'E, Dec 1971, *Thurtell 3896 & Coveny* (BRI, NSW); Basket Swamp, 25 km by road NNE of Tenterfield, Boonoo S.F., 28° 54'S 152° 09'E, Oct 1992, *Wilson 8507* (BRI, NSW).

***Distribution and habitat*:** *Philotheca epilosa* is endemic to the Granite Belt of south-east Queensland (Girraween N.P., Amiens, Stanthorpe) and adjacent north-east New South Wales (Boonoo Boonoo, Bald Rock N.P. Plants grow in open areas of rock slabs and pavements on granite substrates at altitudes between 800 and 1100 m.

***Notes*:** *Philotheca epilosa* is almost sympatric with *P. conduplicata* in Girraween National Park near Wyberba; however, I know of no instances where both taxa have been collected from the same locality. Despite this near geographical proximity of the two taxa, there are no specimens that indicate introgression or hybrid individuals. The absence of intermediates was first noted by Wilson (1970), *viz.* "no herbarium specimens showing any suggestion of integradation between the two". *Philotheca epilosa* is distinctive in the small obovate to oblanceolate leaf laminae that dry strongly concave and the staminal filaments that are eciliate or with only scattered cilia towards the apex.

Philotheca glasshousiensis (Domin) P.I.Forst. **comb. nov.**; *Eriostemon glasshousiensis* Domin, *Biblioth. Bot.* 89: 286 (1926). **Type:** Queensland. Moreton District: Glasshouse Mountains, slopes of Mt Coonowrin, September 1909, *C.T. White s.n.* (holo: PR?, *n.v.;* iso: BRI [AQ314418]).

Eriostemon trachyphyllus var. *leichhardtii* Benth., *Fl. Austral.* 1: 333 (1863); *E. myoporoides* subsp. *leichhardtii* (Benth.) Paul G. Wilson, *Nuytsia* 1: 41 (1970); *Philotheca myoporoides* subsp. *leichhardtii* (Benth.) Bayly, *Muelleria* 11: 124 (1998). **Type:** Brroa [= Mt Beerwah, Glasshouse Mountains], *L. Leichhardt* (holo: K *n.v. fide* Wilson (1970: 41); iso: MEL4536).

***Illustration*:** Bayly (1998: 114, fig. 1c), as *Philotheca myoporoides* subsp. *leichhardtii*.

Woody subshrub to 1 m high; rootstock not rhizomatous. Branchlets densely glandular-verrucose. Leaves densely clustered near stem apices; leaf laminae oblanceolate to oblong-obcuneate, ± flat or somewhat incurved when dry, 20–52 mm long, 5–11 mm wide, length/width ratio of 3–5.7; apex rounded to truncate, abruptly apiculate; base cuneate. Inflorescences pedunculate to 5 mm; with 1–4 flowers; pedicels 4–12 mm long, scattered glandular-verrucose. Petals elliptic-oblong, 6–8.5 mm long, 2.5–3 mm wide, adaxially papillose, abaxially glabrous or with scattered, verrucose glands in the middle towards the apex, cream. Staminal filaments woolly ciliate for entire length, apex densely long-pilose with hairs to 1.5 mm long. Cocci erect, prominently rostrate, 7–11 mm long.

***Selected specimens examined*: Queensland.** Port Curtis District: S.F. 316, Kroombit Tops, 24° 21'S, 150° 56'E, Feb 1995, *Forster PIF16249* (BRI, K, NSW); Kroombit Tops Forest Reserve, 24° 21'S, 150° 56'E, Nov 2003, *Forster PIF29772* (BRI, HO, MEL); S.F. 316, Kroombit Tops, 51 km SSW of Calliope, 24° 25'S, 150° 56'E, May 1988, *Gibson TOI1147* (BRI); ridge to N of Kroombit Creek, c. 6 km SSW of Forestry Barracks, Kroombit Tops S.F., 24° 25'S, 150° 57'E, Dec 1983, *McDonald 3865* (BRI, NSW). Burnett District: Cania Gorge, May 1977, *Olsen 3538 & Byrnes* (BRI); Cania Gorge, c. 26 km NW of Monto, Aug 1980, *Sharpe 2620* (BRI). Wide Bay District: Mt Cooroora, S.F. 963, 2 km W of Pomona, 26° 22'S, 152° 50'E, Sep 1996, *Bean 10746* (BRI, MEL); Mt Cooroora, Pomona, 26° 22'S, 152° 50'E, Feb 1995, *Forster PIF16121* (BRI, MEL); *loc. cit.*, Oct 1999, *Forster PIF24972 & Booth* (BRI, MEL). Moreton District: top of Glasshouses, Jul 1879, *Bailey s.n.* (BRI [AQ151787]); Mt Beerwah N.P., 26° 54'S, 152° 53'E, Aug 1990, *Bean 2150* (BRI); Mt Tibrogargan N.P., 26° 56'S, 152° 57'E, Apr 1993, *Bean 5911* (BRI); 1 km NNE of Mt Tibrogargan, N of Beerburrum, 26° 55'S, 152° 57'E, Feb 1997, *Bean 11666* (BRI); near

top of Mt Ngungun, Jun 1951, *Blake 18765* (BRI); Mt Beerwah, Aug 1966, *Blake 22761* (BRI); Mt Coonowrin, 26° 54'S, 152° 55'E, Jun 1968, *Smith 13967* (BRI); Coochin Hills, east peak, 26° 52'S, 152° 56'E, Aug 1968, *Smith 14035* (BRI); Coochin Hills, near summit of W peak on N side, 26° 52'S, 152° 56'E, Aug 1968, *Smith 14046* (BRI); Glasshouses, Coonoorin (Crookneck) Peak, Aug 1968, *Webster 14990 & Hildreth* (BRI); (BRI); Top of Mt Ngungun, Glasshouse Mountains, Mar 1931, *White 7648* (BRI).

Distribution and habitat: *Philotheca glasshousiensis* is endemic to south-eastern Queensland where it occurs in disjunct populations with a northern limit at Kroombit Tops and a southern limit in the Glasshouse Mountains. Plants occur in small, scattered populations on rocky outcrops and clifflines on substrates derived from metamorphosed sandstones, rhyolite and trachyte at altitudes between 100 and 900m.

Notes: This species occurs in close geographical proximity to *P. queenslandica* but is not "broadly sympatric" with that taxon as stated by Bayly (1998). As noted by Bayly (1998) [there are] "no specimens that could not be readily assigned to one taxon or the other". *Philotheca queenslandica* and *P. glasshousiensis* do not show any evidence of introgression; hence, the observed variation does not fulfil the criteria necessary for them to be allocated subspecies rank.

Philotheca glasshousiensis is perhaps more closely related to *P. obovatifolia* and both share the character of staminal filaments that are ciliate for the entire length. However, it differs from that species by having smaller (20–52 × 5–11 mm) leaves that are oblanceolate to oblong-obcuneate with a length/width ratio of 3–5.7, and the staminal filaments have long-pilose hairs towards the apex. In comparison *P. obovatifolia* has broadly obovate leaves that are noticeably larger (28–60 × (11–) 15–28 mm) with a length/width ratio of 2.2–3.3, and staminal filaments with only a few scattered hairs towards the apex.

Philotheca obovatifolia (Bayly) P.I.Forst. **stat. nov.**; *Philotheca myoporoides* subsp. *obovatifolia* Bayly, *Muelleria* 11: 123 (1998). **Type:** Queensland. Moreton District: Mt Ernest, 10 November 1992, *P.I.Forster PIF12364 & G. Leiper* (holo: BRI; iso: MEL).

Illustrations: Bayly (1998: 114, fig. 4), Logan River Branch S.G.A.P. (Qld Region Inc.) (2002: 323) & Weston & Harden (2002: 296), as *Philotheca myoporoides* subsp. *obovatifolia*.

Woody subshrub to 1 m high; rootstock not rhizomatous. Branchlets sparsely glandular-verrucose. Leaves densely clustered near stem apices; leaf laminae broadly obovate, ± flat, 28–60 mm long, (11–) 15–28 mm wide, length/width ratio of 2.2–3.3; apex obtuse to slightly retuse, shortly mucronate; base cuneate to truncate. Inflorescences pedunculate to 9 mm, with 1–5 flowers; pedicels 5–9 mm long, sparsely glandular-verrucose. Petals elliptic-oblong, 8–9 mm long, 3.5–4 mm wide, adaxially papillose, abaxially glabrous, apart from scattered verrucose glands in the middle towards the apex, cream, tinged with pink. Staminal filaments ciliate for entire length, apex with scattered, longer hairs to 1 mm long. Cocci not seen.

Additional specimens examined: **Queensland.** Moreton District: Mt Barney, near saddle, 28° 17'S, 152° 42'E, Jun 1972, *Bell 538* (BRI); Mt Barney, Oct 1935, *Everist 1390* (BRI); *loc. cit.*, Sep 1949, *Everist 4137* (BRI); Mt Barney, upper slopes SE ridge of East Peak, 28° 17'S, 152° 41'E, Sep 1994, *Forster PIF15720* (BRI, CANB, K, NSW); Mt Barney, summit area East Peak, 28° 17'S, 152° 41'E, Sep 1994, *Forster PIF15722* (AD, BRI); Mt Barney, Dec 1974, *McDonald s.n.* (BRI [AQ151747]); Mt Lindesay, Jul 1934, *Michael 2067* (BRI); *loc. cit.*, Jul 1935, *Michael 2218* (BRI); Mt Barney, Aug 1931, *White 7829* (BRI). **New South Wales.** Werrikimbe N.P., Mt Werrikimbe summit, 31° 13, 152° 13'E, Aug 1998, *Copeland 1042* (BRI, NE).

Distribution and habitat: *Philotheca obovatifolia* is endemic to the extreme south-east of Queensland (Mt Barney, Mt Ernest, Mt Lindesay) and Mt Werrikimbe in north-east New South Wales. Plants occur in montane (800-1300 m) heathland, shrubland or woodland on rocky substrates derived from granite (Mt Werrikimbe) or rhyolite (Mt Barney, Mt Ernest). The species appears to be extinct on Mt Lindesay as it has not been sighted or collected there in the last 20 years despite extensive searches.

Notes: *Philotheca obovatifolia* is a very distinctive, large leaved taxon in this species complex. The single collection from Mt Werrikimbe has stems that are only weakly glandular-verrucose.

Philotheca queenslandica (C.T.White) P.I.Forst. **comb. nov.**; *Eriostemon queenslandicus* C.T.White, *Proc. Roy. Soc. Queensland* 53: 207 (1942); *Eriostemon myoporoides* subsp. *queenslandicus* (C.T.White) Paul G. Wilson, *Nuytsia* 1: 41 (1970); *Philotheca myoporoides* subsp. *queenslandica* (C.T.White) Bayly, *Muelleria* 11: 125 (1998). **Type:** Queensland. MORETON DISTRICT: Caloundra, 23 August 1933, *S.L. Everist 454* (holo: BRI).

***Illustrations*:** Williams (1979: 108), as *Eriostemon myoporoides* subsp. *queenslandicus*; Bayly (1998: 114, fig. 1f) & Haslam (2004: 90), as *Philotheca myoporoides* subsp. *queenslandicus*.

Wiry stemmed subshrub to 1 m high; rootstock often rhizomatous. Branchlets sparsely glandular verrucose. Leaves densely clustered near stem apices; leaf laminae narrow-elliptic to narrow-obovate, flat to concave, 9–30 mm long, 1.5–7 mm wide, length/width ratio of 2.7–10; apex obtuse to acute, shortly mucronate; base attenuate to cuneate. Inflorescences pedunculate to 3 mm, with a solitary flower; pedicels 3–6 mm long, sparsely glandular-verrucose. Petals elliptic-oblong, 4–10 mm long, 1.4–3.8 mm wide, adaxially papillose, abaxially glabrous, apart from scattered verrucose glands in the middle towards the apex, cream, tinged with pink. Staminal filaments densely ciliate for entire length, apex with dense, longer hairs to 1.5 mm long. Cocci erect, bluntly apiculate to shortly rostrate, 5–8 mm long.

***Selected specimens examined*: Queensland.** WIDE BAY DISTRICT: Sandy Creek, c. 10 miles W of Tin Can Bay, Sep 1967, *Brass 33696* (BRI); near Boonooroo, Sep 1948, *Clemens s.n.* (BRI [AQ151812]); Noosa Shire land, 2.5 km W of Lake Weyba, 26° 25'S, 153° 02'E, Jan 2003, *Forster PIF29234 & Thomas* (BRI); Old Hollett road, 2 km W of Lake Weyba, 26° 25'S, 153° 02'E, Mar 2003, *Forster PIF29278 & Thomas* (BRI, MEL, NSW); Peregian, opposite to Lake Weyba N.P., 26° 29'S, 153° 06'E, Sep 1992, *Franks AJG9209018 & Suosaari* (BRI); Cooloola Way, Cooloola N.P., 26° 04'S, 152° 59'E, Aug 1994, *Grimshaw G896 & Turpin* (BRI); Cooloola, just inside northern boundary of R1093, east of Noosa River, Jul 1971, *Harrold 84* (BRI); Noosa Heads, May 1953, *Hunt s.n.* (BRI [AQ151800]); Lake Cootharaba, *s.dat.*, *Keys & Wedd s.n.* (BRI [AQ151803]); near Poverty Point, Tin Can Bay, 25° 57'S, 153° 03'E, Jun 1978, *Williams 78061* (BRI). MORETON DISTRICT: Maroochie, Jul 1879, *Bailey s.n.* (BRI [AQ151796]); Caloundra, Aug 1932, *Blake 4133* (BRI); 0.8 km S of Mt Coolum turnoff (Suncoast Beach Drive) on David Low Way, 26° 34'S, 153° 05'E, Jun 1992, *Doust 357 & Brown* (BRI, NSW); Roys Road, Beerwah, 26° 51'S, 153° 00'E, Oct 1999, *Forster PIF24936* (AD, BRI, MEL, NSW); 1.6 km NE of Landsborough, 26° 47'S, 152° 58'E, Aug 1988, *Ross 3181* (BRI, MEL); 3 km N of Coolum Beach, Jan 1977, *Sharpe 2140* (BRI); Bribie Island – Caboolture road, about halfway, Mar 1964, *van Royen 9339* (BRI); North of Currumundi Lakes, Caloundra, 26° 46'S, 153° 08'E, Mar 1971, *Williams s.n.* (BRI [AQ151794]).

***Distribution and habitat*:** *Philotheca queenslandica* is endemic to south-eastern Queensland with a northern limit at Boonooroo and a southern limit at Bribie Island. Plants occur in lowland, wallum heathlands in boggy or sandy soils that are seasonally moist to inundated at altitudes below 100 m.

***Notes*:** *Philotheca queenslandica* is the most herbaceous of all the species enumerated here (the others are all noticeably woody subshrubs or shrubs) and has been observed to possess a rhizomatous rootstock (not apparent in the other taxa). It perhaps most closely resembles *P. conduplicata;* however, it differs from that species in the smaller leaves (9–30 mm long, versus 30–65 mm long), the leaf shape (narrow-elliptic to narrow- obovate, flat to concave when dry, versus elliptic, falcate and strongly conduplicate when dry) and the smaller flowers (petals 4–10 mm long versus 7–11 mm long) and capsules (5–8 mm long versus 7–9 mm long).

Acknowledgements

Thanks to G. Guymer (BRI) for comments on the manuscript and the Directors of MEL and NSW for access to collections.

References

BAYLY, M.J. (1998). Notes on the *Eriostemon myoporoides* (Rutaceae) species complex, including new names and a new generic placement in *Philotheca*. *Muelleria* 11: 113–126.

CRONQUIST, A. (1988). *The Evolution and Classification of Flowering Plants*, 2nd edition. New York Botanical Garden: Bronx, New York.

DOMIN, K. (1926). *Eriostemon*. In 'Beiträge zur Flora und Pflanzengeographie Australiens'. *Bibliotheca Botanica* 89: 286.

FORSTER, P.I. (2003). *Phebalium distans* P.I.Forst. (Rutaceae), a new and endangered species from

south-eastern Queensland, and reinstatement of *P. longifolium* S.T.Blake. *Austrobaileya* 6: 437–444.

Forster, P.I. (2005). A taxonomic revision of *Actephila* Blume (Euphorbiaceae/ Phyllanthaceae) in Australia. *Austrobaileya* 7: 57–97.

Haslam, S. (2004). *Noosa's Native Plants.* Noosa Integrated Catchment Assoc. Inc.: Tewantin.

Horton, B.M., Crayn, D.M., Clarke, S.W. & Washington, H. (2004). *Leionema scopulinum* (Rutaceae), a new species from Wollemi National Park. *Telopea* 10: 815–822.

Levin, D.A. (1979). The nature of plant species. *Science* 204: 381–384.

Levin, D.A. (2000). *The Origin, Expansion, and Demise of Plant Species.* Oxford University Press: Oxford.

Logan River Branch S.G.A.P. (Qld Region Inc.). (2002). *Mangroves to Mountains.* Copyright Publishing Co. Pty Ltd.: Brisbane.

Ross, E.M. (1983). Rutaceae. In T.D. Stanley & E.M. Ross (eds.), *Flora of South-eastern Queensland* 1: 440–472. Queensland Herbarium, Queensland Department of Primary Industries: Brisbane.

Rozefelds, A.C. (2001). The Tasmanian species of *Philotheca* (Rutaceae). *Muelleria* 15: 19–26.

Stace, C.A. (1989). *Plant Taxonomy and Biosystematics*. 2nd edition. Edward Arnold: London, Melbourne, Auckland.

Stebbins, G.L. (1950). *Variation and Evolution in Plants*. Columbia University Press: New York.

Stuessy, T.F. (1990). *Plant Taxonomy.* Columbia University Press: New York.

Van Steenis, C.G.G.J. (1957). Specific and infraspecific delimitation. *Flora Malesiana*, ser. I, 5: CLXVII–CCXXIX.

Walsh, N.G. (2004). A new species of *Leionema* (Rutaceae) from south-eastern New South Wales. *Telopea* 10: 805–810.

Weston, P.H. & Harden, G.J. (2002). *Philotheca*. In G.J. Harden (ed.), *Flora of New South Wales* 2nd edition, 2: 292–299. University of New South Wales Press: Kensington.

Weston, P.H. & Turton, M. (2004). *Phebalium bifidum* (Rutaceae), a new species from the Capertee Valley, New South Wales. *Telopea* 10: 787–792.

White, C.T. (1942). Contributions to the Queensland Flora, No. 7. *Proceedings of the Royal Society of Queensland* 53: 201–228.

Williams, K.A.W. (1979). *Native Plants of Queensland.* Vol. 1. K.A.W. Williams: North Ipswich.

Williams, K.A.W. (1984). *Native Plants of Queensland.* Vol. 2. K.A.W. Williams: North Ipswich.

Williams, K.A.W. (1987). *Native Plants of Queensland.* Vol. 3. K.A.W. Williams: North Ipswich.

Wilson, P.G. (1970). A taxonomic revision of the genera *Crowea, Eriostemon* and *Phebalium* (Rutaceae). *Nuytsia* 1: 1–155.

Wilson, P.G. (1998a). A taxonomic review of the genera *Eriostemon* and *Philotheca*. *Nuytsia* 12: 239–265.

Wilson, P.G. (1998b). New species and nomenclatural changes in *Phebalium* and related genera (Rutaceae). *Nuytsia* 12: 267–288.

Papuasian Orchid Studies, 2

Paul Ormerod

Summary

P. Ormerod (2005). Papuasian Orchid Studies, 2. *Austrobaileya* 7(1): 183–203. The new species *Dendrobium eymanum, D. flebiliflorum, D. paragnomus, D. spenceanum, D. spinuliferum, D. stipiticola, Glomera pseudomonanthos, Pseuderia takeuchii, Robiquetia brassii* and *Tainia serratiloba* are described from Papuasia (Indonesian Papua, Papua New Guinea, Solomon Islands). All species are illustrated and notes are provided on their affinities, distribution and habitats.

Key Words: Orchidaceae, *Dendrobium eymanum, Dendrobium flebiliflorum, Dendrobium paragnomus, Dendrobium spenceanum, Dendrobium spinuliferum, Dendrobium stipiticola, Glomera pseudomonanthos, Pseuderia takeuchii, Robiquetia brassii, Tainia serratiloba,* Papua New Guinea flora, Indonesian Papua flora, new species

P. Ormerod, P.O. Box 8210, Cairns, Queensland 4870, Australia.

Introduction

This paper is the second in a series devoted to the study of Papuasian Orchids and deals with fourteen species belonging to five genera. The first part (Ormerod 2003) dealt with five species and two subspecies belonging to the genera *Appendicula* Blume, *Dendrobium* Sw. and *Eulophia* R.Br. ex Lindl. The orchid flora of Papuasia (Indonesian Papua, Papua New Guinea, Solomon Islands) comprises approximately 2800 species distributed in about 137 genera. Despite this richness there is comparatively little basic taxonomic work in progress. This paper is thus an attempt to redress the latter situation and draws attention to a number of infrequently collected and previously undescribed taxa.

Materials and methods

This study is mostly based on examination of rehydrated herbarium materials from Papuasia. Living and spirit-preserved material was examined only for the description of *Dendrobium paragnomus*. Herbarium collections were studied from AMES, BRI, K, LAE and NSW. All specimens have been seen unless otherwise indicated.

Taxonomy

Dendrobium Sw.

In the broad sense of this genus the island of New Guinea has about 420 species (Schuiteman & de Vogel 2001). The notes below mostly concern taxa in the sections *Latouria* and *Pedilonum*; however, a new species is also named from the section *Herpetophytum.*

Dendrobium sect. **Herpetophytum** Schltr.

This section contains sixteen accepted species all endemic to New Guinea. The known taxa are *D. appendicula* Schltr., *D. decumbens* Schltr., *D. disoides* Schltr., *D. fusciflorum* Ormd., *D.glossorhynchoides* Schltr., *D herpethophytum* Schltr., *D. hippocrepiferum* Schltr., *D.millarae* A.D.Hawkes, *D. minimiflorum* Gilli, *D. nigricans* Schltr., *D. oxychilum* Schltr., *D. podocarpifolium* Schltr., *D. scopula* Schltr. (syn.: *D. lucidum* Schltr.), *D. vagabundum* A.D.Hawkes & Heller, *D. vestigiiferum* J.J.Sm. and *D. vonroemeri* J.J.Sm. The plants are easily mistaken in herbaria for specimens of *Podochilus* Blume due to a superficially similar habit of wiry, branching stems with small leaves. Apart from the distinctive habit, plants of section *Herpetophytum* are characterized by having single-flowered inflorescences, nonresupinate flowers lasting several days and connate lateral sepals which form a frontally closed oblongoid mentum.

Recently I added *Poaephyllum fuscum* Ridl. to this section as *Dendrobium fusciflorum* with the comment that it has the longest leaves (to 43 mm) in the section (Ormerod 2002). This remark is incorrect; both *D. podocarpifolium* Schltr. and *D. vagabundum* A.D.Hawkes & Heller have longer leaves (to 60mm long).

Accepted for publication 8 August 2005

Dendrobium stipiticola Ormerod **sp. nov.**

Species nova in sectione *Herpetophyto* singularis, foliis carnosis brevisque, labellis subbilobatis et epichilio obsolescenti statim dignoscenda. **Typus:** Papua New Guinea. Western Highlands Province: Mt. Hagen Subdistrict, Tomba to Mt. Hagen track, 26 May 1972, *P.F. Stevens & J.F. Veldkamp LAE 54919* (holo: AMES).

Epiphytic herb. Roots terete, 0.5–0.8 cm thick. Primary stem at least 30 cm long and 0.09–0.11 cm thick; with stemlets to 7.5 cm long and 0.1–0.15 cm thick arising every 1.5–4 cm, these root at the base and become bare in the lower half as the leaves dehisce. Leaves fleshy, subfalcate-oblong and obtuse in lateral view, mid dull green, to 6 mm long, one side *c.* 1.75 mm wide; leaf sheaths smooth. Inflorescences single, axillary, one-flowered, *c.* 1 mm long. Flowers nonresupinate; pedicel plus ovary clavate, *c.* 4 mm long; sepals yellow in bud but dirty white when open, lip edged purple. Dorsal sepal oblong-elliptic, obtuse, margins involute in upper half, *c.* 6.5 mm long and 2.5 mm wide; lateral sepals broadly ovate-elliptic, with an oblong-elliptic basal dilation *c.* 2.5 mm long, that forms with the columnfoot a *c.* 3 mm long oblongoid and retrorse mentum, obtuse, margins involute in apical third, *c.* 5 mm long at midline and *c.* 3 mm wide halfway. Petals oblong-elliptic, subacute, *c.* 6 mm long and 2 mm wide; labellum with claw *c.* 3 mm long and 2 mm wide thence expanding into a transversely elliptic-reniform blade *c.* 4 mm long and 6mm wide with broadly elliptic-subquadrate broadly rounded sidelobes and a minute recessed emarginate midlobe. Column semiterete, *c.* 2.5 mm long with columnfoot about 3 mm long. **Fig. 1.**

***Distribution and habitat*:** Papua New Guinea, Western Highlands Province. Lower montane forest, *c.* 2980 m. The type was collected from a fallen log.

***Notes*:** This species is unique in the section due to its combination of short fleshy leaves and its flowers with a sub-bilobed lip with a tiny recessed midlobe. The collectors of the type also believed they saw the same species lower down at 2560 m.

***Etymology*:** The specific epithet is derived from the classical Latin *stipitis* (stalk or stem; in classical times applied to a log, stump or trunk of a tree) and the compound *cola* (a dweller) in reference to where the type specimen was found growing.

Dendrobium sect. **Latouria** (Blume) Miq.

There are about 53 currently accepted species in this section. Another four are added here along with some notes on synonymy and a previously overlooked combination. The previous revision of sect. *Latouria* by Cribb (1983) dealt with 48 taxa and is still a quite useful account for orchid hobbyists since all the later described entities are rarely encountered in horticulture and then usually in specialist collections.

Dendrobium eymanum Ormerod **sp. nov.**

Species nova affinis *D. acutisepalo* J.J.Sm. sed carinis labelli glabris et apicis oblique elevates differt. **Typus:** Indonesia. Papua Province: Wissel Lakes area, Enarotali to Koegapa, Egogitoagapa to Enarotali, 29 March 1939, *P.J. Eyma 4814* (holo: AMES [right hand specimen]; iso: K, L *n.v.*).

Dendrobium acutisepalum auct. *non* J.J.Sm.: van Royen (1979: 314, *p.p.*); Cribb (1983: 305, *p.p.*).

Roots fleshy, terete, 0.2–0.3 cm thick. Stem 5–6 leaved in upper half, terete, to 24 cm long and 0.4–0.5 cm thick; internodes 0.85–3.5 cm long. Leaves stiffly coriaceous, erect, elliptic, obtuse to weakly bilobed, 3–5 cm long and 1.7–2.4 cm wide. Inflorescences subterminal, laxly 7–10 flowered, to 22 cm long; peduncles 12–14.5 cm long; sheathing bracts 2–3, scattered, tubular, clasping, 1.2–1.4 cm long; rachis to 7.5 cm long; floral bracts lanceolate-cymbiform, acute, 0.6–0.9 cm long and 0.2–0.3 cm wide. Flowers resupinate, colour unknown; pedicel plus ovary terete, becoming weakly obconical and with low (irregular or wavy) ribs 20–28 mm long. Dorsal sepal oblong, acute, *c.* 13 mm long and 4.1–5 mm wide; lateral sepals ovate-elliptic, acute, medially carinate, *c.* 13 mm long and 10.5 mm wide basally, at middle *c.* 5 mm wide, forming with the columnfoot a conical 7.5–8 mm long

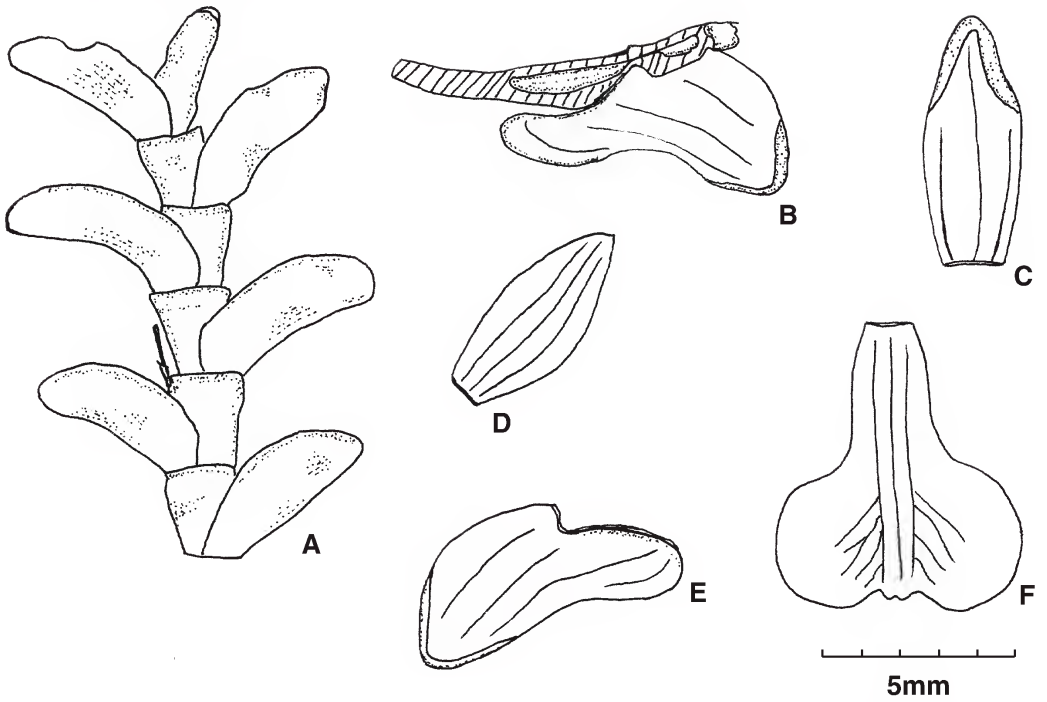


Fig. 1. ***Dendrobium stipiticola.*** A. apex of stemlet with old inflorescence remnant. B. longitudinal section of pedicel plus ovary and column with lateral sepal. C. adaxial view of dorsal sepal. D. adaxial view of petal. E. adaxial view of lateral sepal. F. adaxial view of labellum. All from *Stevens & Veldkamp LAE 54919* (AMES). Scales as indicated.

---

mentum. Petals obovate-elliptic, *c.* 13.5 mm long and 5 mm wide; labellum trilobed, *c.* 17 mm long; hypochile *c.* 16 mm long to tip of sidelobes (including the *c.* 5 mm long 'claw') and 12 mm wide; sidelobes obliquely obcuneate, obtuse; callus of three thickly laminate carinae most prominent between the sidelobes, the midkeel only evident apically, apices rounded and raising forward, *c.* 2 mm high at termination at base of epichile; epichile concave, transversely elliptic-trapeziform, subacute, *c.* 5.5 mm long and 4 mm wide. Column short, stout, *c.* 2 mm long; columnfoot 7.5–8 mm long. **Fig. 2.**

***Distribution and habitat*:** Indonesia, Papua Province. Heath vegetation at *c.* 3000 m.

***Notes*:** Florally this species strongly resembles *Dendrobium acutisepalum* J.J.Sm. from which it may be distinguished by the slightly longer mentum (7.5–8 mm vs. 6 mm), an oblong (versus elliptic) dorsal sepal, a labellum callus with glabrous, thickly laminate carinae that raise up and forward at termination and the transversely elliptic-trapeziform (or subtrilobate) midlobe. In *D. acutisepalum* the lip has a callus with thicker keels that are verrucose above in the upper half which do not raise forward obliquely at termination and the midlobe varies from rhombic to oblong-lanceolate but is never subtrilobate.

On the type sheet of *D. eymanum* I have chosen the specimen on the right hand side of the sheet to be the holotype. The material on this sheet is not a mixture it is just that the specimen on the left hand side has slightly younger flowers.

Dendrobium eymanum probably occurs at higher altitudes (3000 m+) since it was collected in an area of heath vegetation which is typically an element of the alpine flora.

***Etymology*:** The specific epithet honours P.J. Eyma, collector of the type specimen.

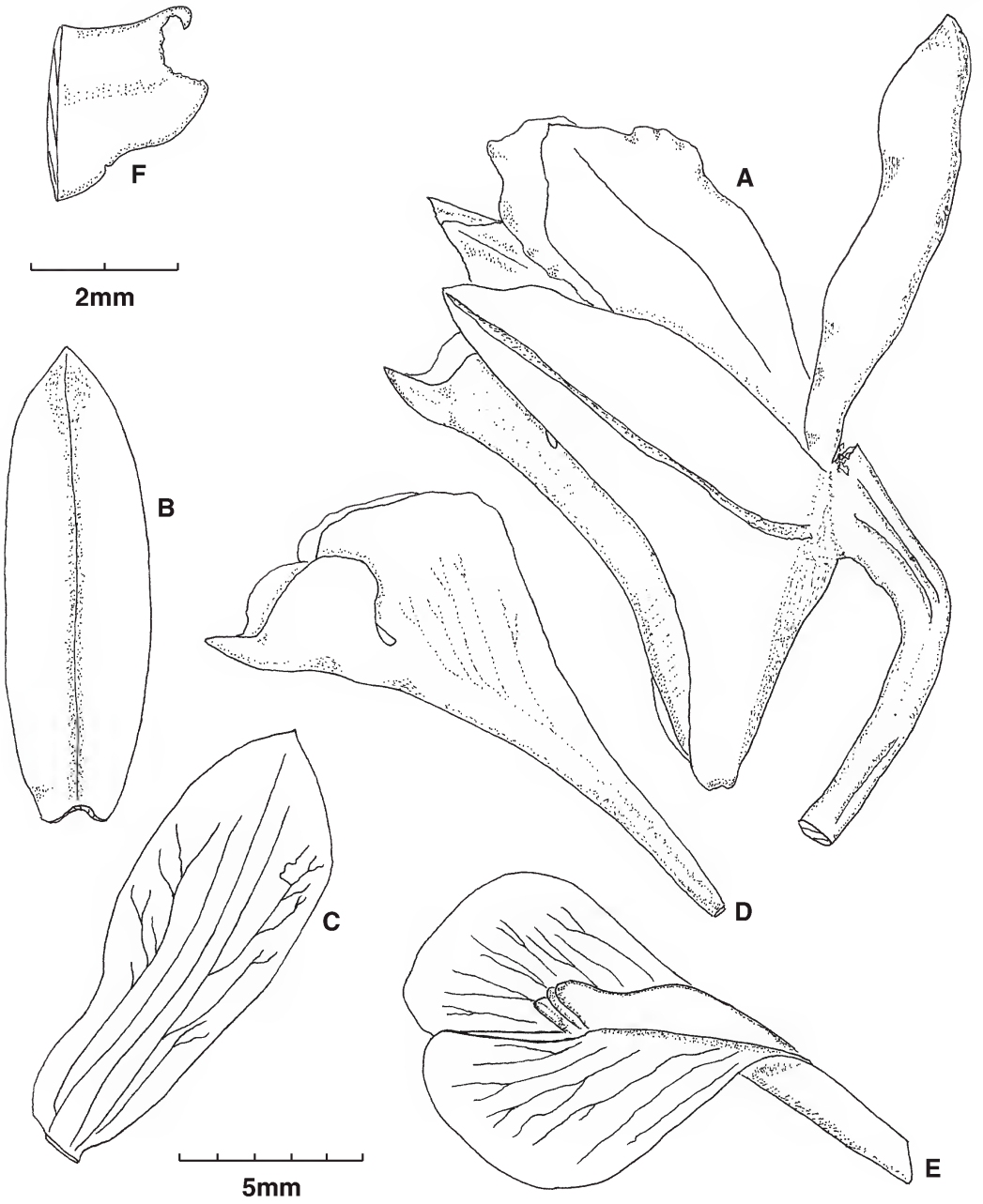


Fig. 2. ***Dendrobium eymanum.*** A. lateral view of flower. B. adaxial view of dorsal sepal. C. adaxial view of petal. D. lateral view of labellum. E. labellum minus midlobe with sidelobes spread. F. column. All from *Eyma 4814* (AMES). A-E and F to respective scales.

Dendrobium flebiliflorum Ormerod **sp. nov.**

Species nova inter species generis *Dendrobii* mento floris semilunatis, labello trilobatis et epichilio transverse ellipticis distincta. **Typus:** Papua New Guinea. Southern Highlands Province: Ialibu area?, received 22 January 2003, cult. *G.C. Stocker s.n.* (holo: BRI [AQ751261]).

Stems narrowly clavate, shallowly sulcate, erect, bifoliate, *c.* 18 cm long and 0.25–0.3 cm wide basally, *c.* 0.4 cm wide at middle. Leaves broadly oblong, acute, 3–6 cm long and 1.5–1.9 cm wide. Inflorescences subterminal, erect, 2–3 flowered, up to 4.5 cm long; peduncles up to 3.2 cm long; rachis weakly fractiflex (zig zag), up to 1.3 cm long; floral bracts ovate, acute, *c.* 0.4 cm long and 0.2 cm wide. Flowers resupinate; pedicel plus ovary clavate, 1.6–1.7 cm long; sepals greenish tinted brownish, whitish at base. Dorsal sepal broadly ovate, acute, *c.* 7 mm long and 5 mm wide; lateral sepals broadly ovate, acute, forming with the columnfoot an 8–9 mm long incurved-semilunate obtuse mentum, *c.* 8 mm long and 9.5 mm wide. Petals broadly oblong-subcuneate, acute, *c.* 8 mm long and 3 mm wide; labellum trilobed, *c.*10 mm long; hypochile with obliquely oblong sidelobes, half of apex minutely denticulate, other half rounded-entire, sidelobes *c.* 6 mm long and 4 mm wide basally then slowly narrowing to *c.* 3 mm wide; callus of three laminate keels highest at their termination at the base of the midlobe; epichile transversely elliptic-reniform, margins minutely erose-denticulate, *c.* 3 mm long and 6 mm wide. Column short, *c.* 3.5 mm long and *c.* 3 mm wide at base; anther cap *c.* 1 mm long; columnfoot *c.* 8 mm long. **Fig. 3.**

***Distribution*:** Papua New Guinea. The precise distribution of this species is unknown.

***Notes*:** This plant is a singular, small-flowered species of which I know no close relatives. It is distinctive in having flowers with a blunt, semilunate mentum combined with a trilobed lip with a low, trilaminate callus and transversely elliptic midlobe.

***Etymology*:** The specific epithet is derived from the Latin *flebilis* (mournful or sad) and *florus* (flowered) in reference to the dull colour of the flowers.

Dendrobium montis-yulei Kraenzl., in A.Engler, *Pflanzenr.* IV. 50. II. B. 21, 45: 150 (1910).

Type: Papua New Guinea. Central Province: near Mt. Yule, *W. McGregor s.n.* (holo: B†; iso: HBG (photograph and sketch seen)).

Dendrobium terrestre J.J.Sm., *Bull. Jard. Bot. Buitenz.* 2: 10 (1911), ***syn. nov.*** **Type:** Indonesia. Papua Province: Mt. Goliath, March 1911, *A.C. de Kock 119* (holo: BO *n.v.*).

***Additional specimen examined*: Indonesia.** Papua Province: Wissel Lakes, Enarotali, May 1960, *Vink & Schram 8599* (AMES).

***Distribution*:** Indonesia (Papua Province); Papua New Guinea (Central Province).

***Notes*:** Cribb (1983) correctly suspected that *D. montis-yulei* was the earlier name for *D. terrestre* but due to the unavailability of type material he did not combine the two. Since then the type specimen (or part of it) has been located in Hamburg. Dr. Dariusz Szlachetko kindly sent an analytical drawing and photograph of the latter, interpretation of which confirms the need for the above reduction.

Cribb (1983) also noted two albinistic variants from Papua New Guinea. A similar form also seems to occur in Indonesian Papua Province, since according to the collectors of the above number from Wissel Lakes, it has white flowers, a green lip and a column coloured green with red.

Dendrobium spenceanum Ormerod **sp. nov.**

Species nova affinis *D. rarifloro* J.J.Sm. sed petalis obovatis et epichilio labelli profunde emarginatis differt. **Typus:** Indonesia. Papua Province: 4 km SW of Bernhard Camp, Idenburg River, March 1939, *L.J. Brass 13324* (holo: AMES).

Epiphytic herb. Rhizome abbreviated. Roots terete, relatively fleshy, to 1.8 mm thick. Stems unifoliate, when ovoid (then *c.* 13 mm long and 6 mm thick), fusiform when older, *c.* 25 mm long and 5.5 mm thick, lower part *c.* 2 mm thick. Leaves stiffly coriaceous, oblong-elliptic, acute, *c.* 35 mm long and 13 mm wide. Inflorescences pseudoterminal, one flowered, *c.* 27 mm long;

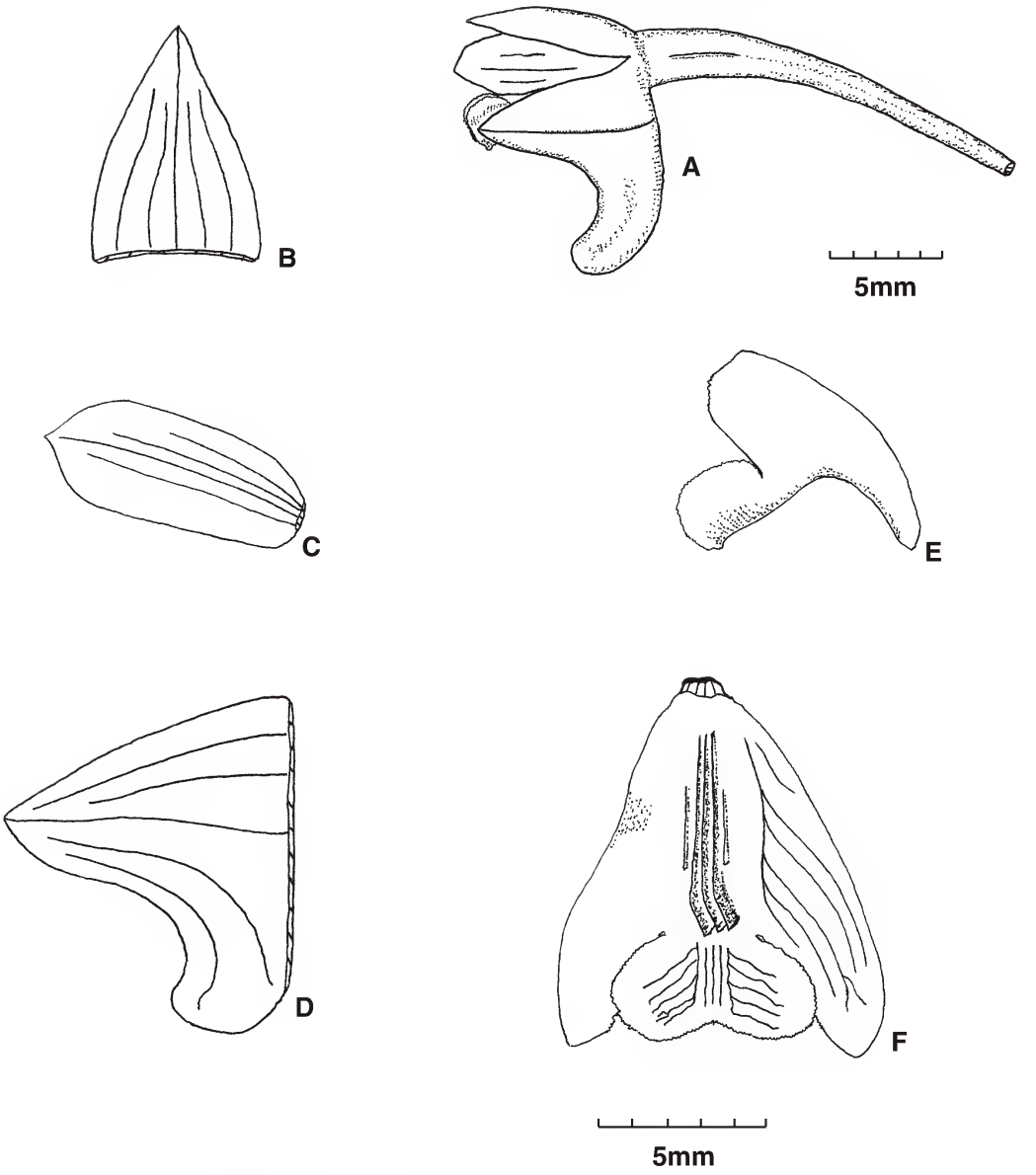


Fig. 3. ***Dendrobium flebiliflorum.*** A. lateral view of flower. B. adaxial view of dorsal sepal. C. adaxial view of petal. D. adaxial view of lateral sepal; E. lateral view of labellum. F. adaxial view of labellum. All from *Stocker s.n.* (BRI [AQ751261]). A and B-F to respective scales.

sheathing bracts *c.* 2.5 mm long; floral bracts *c.* 2 mm long. Flowers *c.* 11 mm long; pedicel plus ovary weakly ribbed, narrowly clavate, glabrous; sepals and petals dirty white, lip brown. Dorsal sepal elliptic, obtuse, *c.* 13 mm long and 6.5 mm wide; lateral sepals broadly elliptic, obtuse, *c.* 12 mm long and 11 mm wide, forming with the columnfoot a *c.* 5 mm long bluntly conical mentum. Petals obovate, minutely apiculate *c.* 12 mm long and 7 mm wide; labellum trilobed, flabellate-obdeltate, *c.* 16 mm long and 17 mm wide; callus *c.* 9 mm long, thickly tricarinate in apical third, its lateral carinae weakly evident basally, the midkeel most

evident apically; sidelobes broadly obovate-subquadrate, rounded, *c.* 6.5 mm wide (measured obliquely in free part); epichile transversely oblong-bilobulate (each side obliquely subquadrate), deeply emarginate, *c.* 3 mm long and 7 mm wide. Column semiterete-conical, *c.* 2.5 mm long; columnfoot *c.* 5 mm long. **Fig. 4.**

***Distribution and habitat*:** Indonesia, Papua Province. Lower montane mossy forest at *c.* 900 m.

***Notes*:** The plant habit and general lip shape (including the callus) of this species is reminiscent of *D. rariflorum* J.J.Sm. It differs from that species in having obovate petals and a lip with a transversely oblong-bilobulate midlobe. In *D. rariflorum* the petals are rhombic and the lip has an elliptic-subrhombic midlobe longer than broad.

***Etymology*:** The species is named after Mr. Phil Spence who has long maintained a specialist interest in the taxa of section *Latouria* with regards to both cultivation and taxonomy.

Dendrobium spinuliferum Ormerod **sp. nov.**

Ab omnibus aliis speciebus sectionis *Latouriae* inflorescentiis sub-unifloris, floribus pallide viridibus, labello flabellatis humili-carinatis et nervis pro medio molliter spinuliferis longis distinguitur. **Typus:** Indonesia. Papua Province: 15 km SW of Bernhard Camp, Idenburg River, January 1939, *L.J. Brass 12051* (holo: AMES).

Epiphytic herb. Rhizome abbreviated. Roots several, terete, *c.* 1 mm thick. Stems bifoliate, narrowly clavate, to 65 mm long and 3 mm thick. Leaves coriaceous, lanceolate, acute, *c.* 37 mm long and 7 mm wide. Inflorescences subterminal, one (two?) flowered, *c.* 5 mm long; floral bracts broadly ovate, cupular, acute, *c.* 2 mm long. Flowers resupinate; pedicel plus ovary terete, obconically dilated apically, *c.* 20 mm long, glabrous; sepals and petals pale green, lip pencilled with purple. Dorsal sepal ovate-elliptic, acute, *c.* 14 mm long and 7 mm wide; lateral sepals ovate-deltate, acute, *c.* 15 mm long and 12 mm wide, forming with the columnfoot a *c.* 8 mm long bluntly conical mentum. Petals oblong-lanceolate, acute, *c.* 13.5 mm long and 4 mm wide; labellum trilobed, broadly clawed thence widely flabellate-obdeltate; hypochile *c.* 17 mm long and 20 mm wide with the *c.* 8 mm wide sidelobes irregularly erose-truncate apically; keels three, rather low, separated, each broadly grooved above, the lateral ones each terminating in a line of softly fleshy spinuliform projections and also flanked alongside the outer edges with a line of the same projections which also occur occasionally on the veins of the sidelobes; epichile stiffly flexible, transversely elliptic-reniform when spread, margin irregular, apex decurved, acute, *c.* 5 mm long and 10 mm wide. Column short, subconical, *c.* 3 mm long; columnfoot 7.5–8 mm long. **Fig. 5.**

***Distribution and habitat*:** Indonesia, Papua Province. Lower montane mossy forest at *c.* 1800 m.

***Notes*:** This species seems to stand alone in section *Latouria* due to its combination of rare characters such as the very short inflorescence of one relatively large flower, the large sidelobes irregularly toothed at the front and the low separated keels terminating in and flanked by soft spinuliform projections.

The type specimen has only one leaf but an abscission scar on that leaf-bearing stem indicates that two leaves were originally present.

***Etymology*:** The specific epithet is derived from the Latin *spinula* (a small thorn or prickle) and the compound *-fer* (carrying or bearing), in reference to the labellum with spinuliform processes.

Dendrobium stenopterum (Rchb.f.) Chadim, Orchadian 4: 28 (1972).

Dendrobium macrophyllum A.Rich. var. *stenopterum* Rchb.f., *Gard. Chron. 3rd series* 3: 393 (1888).

Type: *Sine loc.* [? New Guinea], May 1888, cult. *W. Bull s.n.* (holo: W *n.v.*, icon W49207, microfiche seen).

Distribution: Not known.

***Notes*:** The above combination has been overlooked probably because Chadim (1972) made it among the bibliography at the end of his article. He definitely accepted the name *D. stenopterum* for a species different from

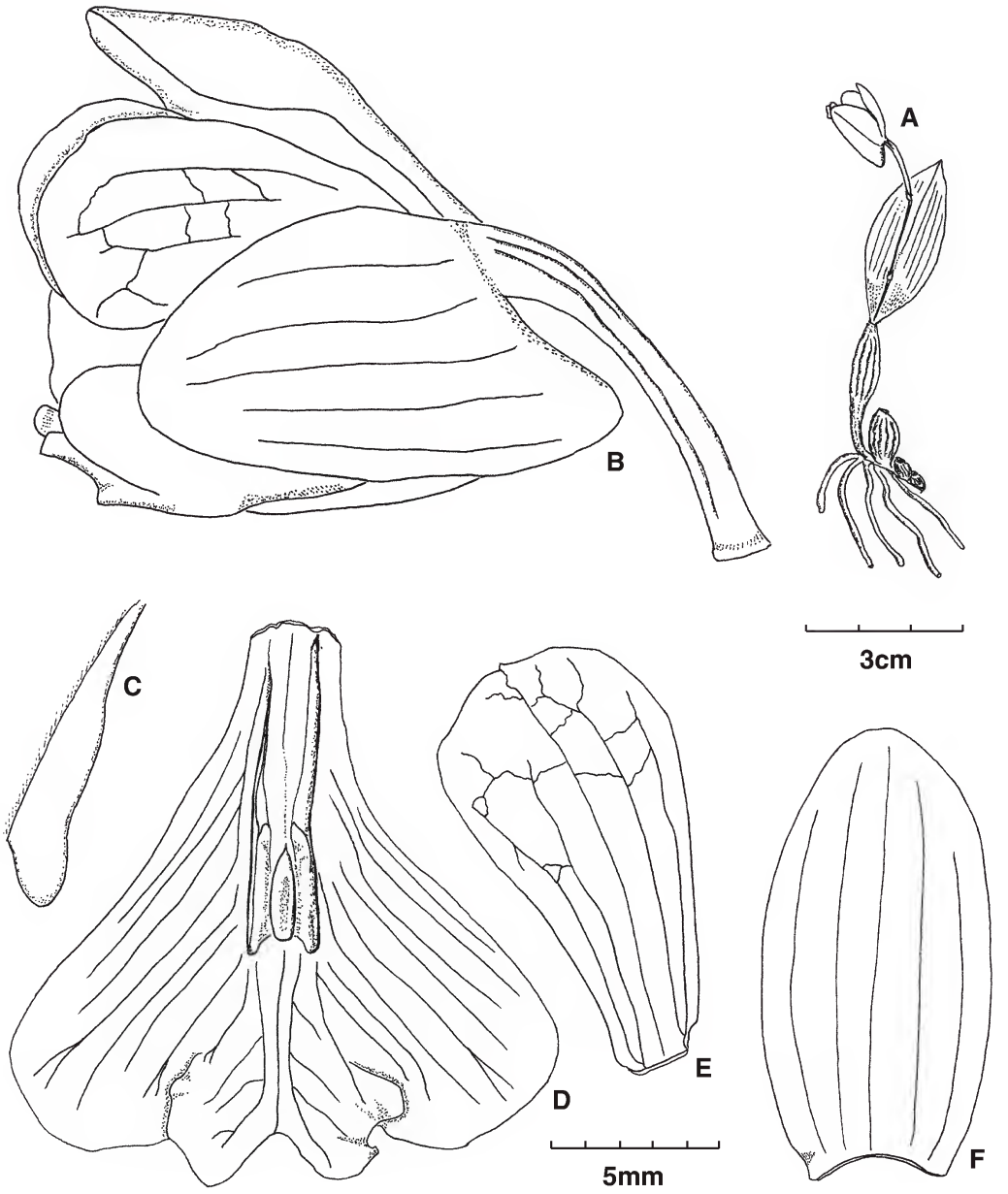


Fig. 4. ***Dendrobium spenceanum.*** A. plant. B. lateral view of flower. C. lateral profile of callus. D. adaxial view of labellum. E. adaxial view of petal. F. adaxial view of dorsal sepal. All from *Brass 13324* (AMES). A and B-F to respective scales.

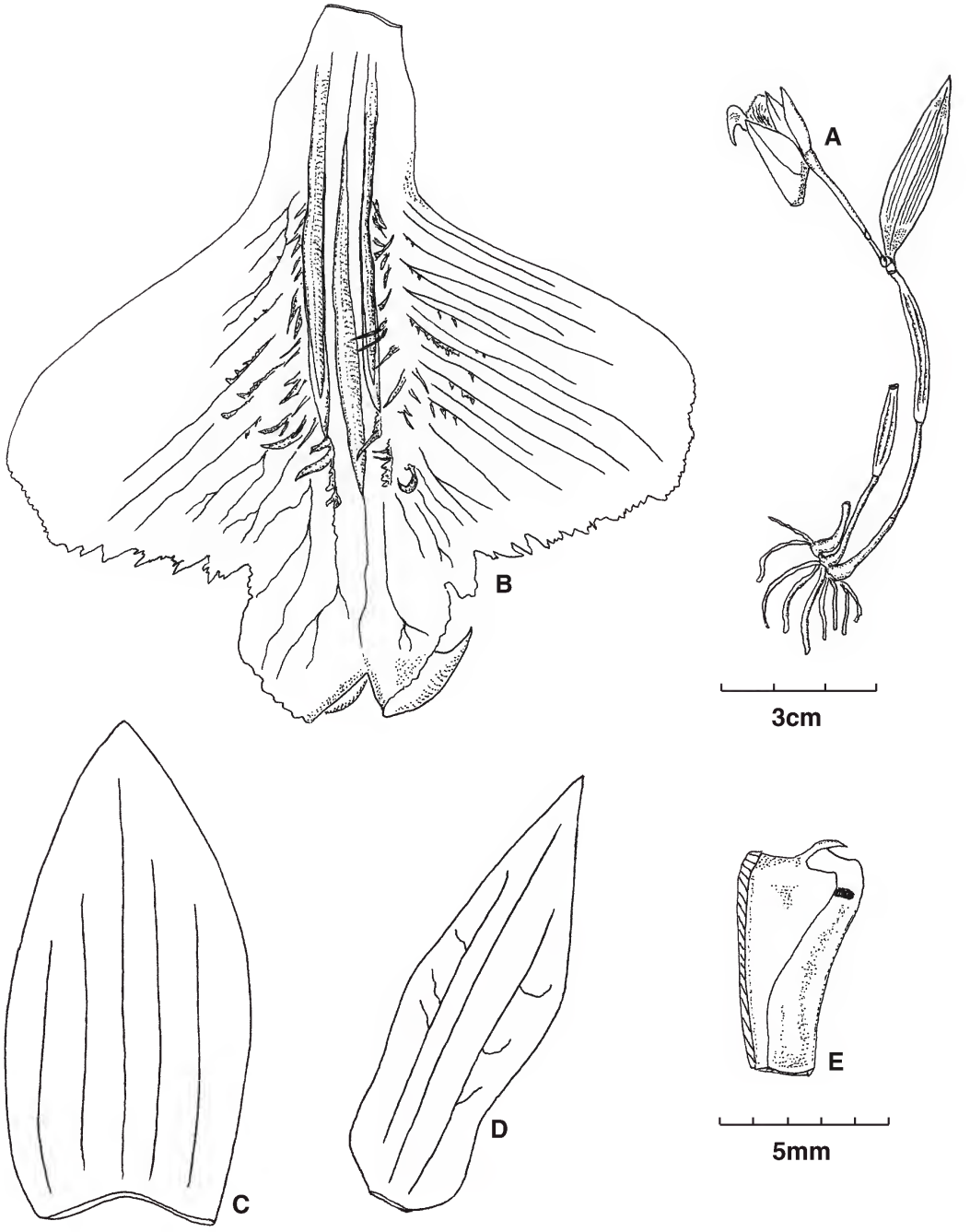


Fig. 5. ***Dendrobium spinuliferum.*** A. plant. B. adaxial view of labellum. C. adaxial view of dorsal sepal. D. adaxial view of petal. E. column. All from *Brass 12051* (AMES). A and B-E to respective scales.

D. macrophyllum A.Rich. even though the transfer is found only in the bibliography.

Dendrobium stenopterum is a member of the *D. polysema* Schltr. complex which occurs in the Philippines, Sulawesi to New Guinea and down to Vanuatu. It has been very difficult for me to distinguish species in this group as all the forms seem to run into each other. However Phil Spence (pers. comm.) has found discriminatory characters for taxa in this complex and he intends to elaborate on these in a proposed book on section *Latouria.*

Dendrobium sect. **Pedilonum** Blume

Dauncey (2003) published a revision of this section, accepting 47 species. To this section I would add *D. limpidum* Schuit. & de Vogel, *D. scabrifolium* Ridl. (? = *D. crenatifolium* J.J.Sm.), *D. usitae* Yukawa (a natural hybrid between *D. bullenianum* Rchb.f. and *D. goldschmidtianum* Kraenzl.) and *D. paragnomus* which is described below. Also I restate my position on *D. obtusum* Schltr. and extend the distribution of one species to Indonesian Papua.

Dendrobium nothofagicola T.M.Reeve, *Orchadian* 7: 134 (1982). **Type:** Papua New Guinea. Enga Province: Wabag Distr., Yulimandaka via Sopas, (fl. in cult. June 1981), *P. Ken sub T. Reeve 551* (holo: LAE, *n.v.;* iso: E, K, NSW *n.v.*).

***Additional specimen examined*: Indonesia**. Papua Province: 18 km NE of Lake Habbema, Bele River, Nov 1938, *Brass 11099* (AMES).

***Distribution*:** Indonesia (Papua Province); Papua New Guinea.

***Notes*:** This species has not been previously recorded for the Indonesian province of Papua. The flowers of this collection were recorded as being orange-yellow and are typical for the species.

Dendrobium obtusum Schltr., in K.Schum. & Lauterb., *Fl. Schutzgeb. Sudsee, Nachtr.* 2: 177 (1905). **Type:** Papua New Guinea. West Sepik Province: Torricelli Ranges, April 1902, *R. Schlechter 14451* (holo: B†).

***Distribution*:** Indonesia (Papua Province); Papua New Guinea (including Bougainville).

***Notes*:** Dauncey (2003) has accepted *D. concavissimum* J.J.Sm. as the correct name for this species whilst accurately noting that the name *D. lauterbachianum* A.D.Hawkes is a superfluous and illegitimate replacement for *D. obtusum* Schltr.

I have previously outlined my arguments why *D. obtusum* was a valid name and not a homonym of "*D. obtusa*" Rchb.f. 1861 (Ormerod 1995). The latter name occurs in the index of Walper's *Annales* (Reichenbach 1861: 1150) under *Dendrobium.* It is quite obvious that the epithet and reference "*D. obtusa* Bl. (s.) 500. no. 24." refers to *Dendrocolla obtusa* Blume which is listed by Reichenbach as a synonym of *Sarcochilus obtusus* (Blume) Rchb.f.

It cannot be argued that *Dendrobium obtusa* of 1861 is a valid name or transfer because it was NOT accepted by the supposed author who correctly indicates by placing an "(s.)" with it in the index that it is a synonym. Thus the name "*D. obtusa"* is invalidly published because it is not accepted (Greuter *et al.* 2000,) and it thus has no status under the ICBN (*Art. 12*). Therefore the later *D. obtusum* of Schlechter must be accepted as a valid name and not a homonym.

Dendrobium paragnomus Ormerod **sp. nov.**

Species nova affinis *Dendrobio gnomo* Ames sed foliis latiusculis, inflorescentiis sessilis, floribus glabris (non scabris) et marginibus labelli integris (non minute erosis) differens. **Typus:** Papua New Guinea? cult. *G.C. Stocker sub P. Ormerod 23* (holo: BRI).

Dendrobium sp. aff. *D. gnomus*: Lavarack *et al.* (2000: 241).

Roots filamentous, white. Rhizome short. Stems clustered, 6–10 leaved in apical half, to 35 cm long and 0.6 cm thick; internodes cylindrical, 0.5–1.5 cm long. Leaves oblong-lanceolate, subacute, 2.7–3.5 cm long, 1.2–0.9 cm wide; sheaths purple-red with slightly raised nerves, ashy white when old, ± truncate. Inflorescences sessile, *c.* 3 mm long, four-flowered, on leafless

stems or below leaves on leafy stems; floral bracts deltate-cymbiform, subacute, 5–6 mm long and 4 mm wide. Flowers resupinate; pedicel plus ovary narrowly clavate, ribbed, 7–8 mm long, glabrous, unscented, long lasting; sepals, petals and lip dark vivid mauve. Dorsal sepal ovate-elliptic, subacute, *c.* 8 mm long and 3.7 mm wide; lateral sepals obliquely ovate-elliptic, subacute, *c.* 13 mm long and 5 mm wide, forming with the column-foot a mentum *c.* 5 mm long. Petals oblong, acute, 7.5–8 mm long and 2.5 mm wide; labellum obovate-trulliform, subacute, apical 1/3 obtusely deflexed, *c.* 12 mm long and 5 mm wide, the basal 1/4 concave with fluid inside, *c.* 3 mm long and 2.5 mm wide, separated from the lamina by a transverse septum, constriction at septum *c.* 2 mm wide, lamina *c.* 9 mm long and 5 mm wide. Column *c.* 2.5 mm long; columnfoot appressed to ovary, *c.* 4.5 mm long. **Fig. 6.**

***Distribution*:** Papua New Guinea?

***Notes*:** This species is closely related to *D. gnomus* Ames from the Solomon Islands but has slightly broader leaves, sessile inflorescences, glabrous (not scabrous) flowers with the labellum margin entire (not minutely erose). Dauncey (pers. comm.) kindly confirmed that the present taxon was undescribed.

Dr. Geoff Stocker obtained this plant from Papua New Guinea in the early 1970's but was unaware of where it was originally collected. It is an attractive species now fairly common in Australian orchid collections thanks to Dr. Stocker's efforts in propagating it.

***Etymology*:** The specific epithet is derived from the Greek compound *para* (near or similar to) and *gnomus* (a dwarf), in reference to the similarity of the species to *D. gnomus* Ames.

Glomera Blume

There are 41 species in New Guinea so far recognised for this genus that extends from Thailand (Seidenfaden & Pedersen 2003) to Samoa. Several species remain to be described, some of them quite large plants. The flowers are quite similar in most species but diagnostic characters are often readily detected in the vegetative parts of the plants.

Glomera pseudomonanthos Ormerod **sp. nov.**

Glomerae subpetiolatae Schltr. arcte affinis sed caulibus 4–7 mm (non 2–3 mm) diam., foliis oblongis 9–13 mm latis (non ligulatis-lanceolatis 4.5–7 mm latis), et floribus virgineis praeter labellum viride apice atroviridi usque purpureo-nigro (adversum flores virgineos tantum apice labelli atroviride) distinguenda. **Typus:** Papua New Guinea. Morobe Province: Dawon, 12 June 1964, *A. Millar NGF23408* (holo: LAE; iso: AMES, BRI, K; BO, CANB, L *n.v.*).

Epiphytic or terrestrial herb. Rhizome short. Stem terete at base, becoming complanate, 29–36.5 cm long and 0.2–0.5 cm wide, laxly 4–8-leaved or more. Leaves ±oblong, sub-equally and obtusely bilobed, subpetiolate, 3–6.5 cm long and 0.9–1.3 cm wide, light to dark glossy green; sheaths obcuneate, apex truncate, smooth, lightly striate, 1.1–2.3 cm long and 0.4–0.7 cm wide. Inflorescences terminal, capitate, subglobose, *c.* 1.5 cm wide; subtending sheath ovate-elliptic, acute, *c.* 2 cm long and 1.2 cm wide. Flowers resupinate; pedicel plus ovary six-ribbed, 5–7 mm long, glabrous; sepals and petals white to greenish-white, lip green to dark green with apex dark green to purple-black. Dorsal sepal broadly elliptic, shortly acuminate, 5-nerved, 4–4.5 mm long and 3–3.5 mm wide; lateral sepals elliptic-quadrate, very shortly acuminate, 5-nerved, connate to the back of the spur, *c.* 5 mm long and 3.5 mm wide. Petals obovate-elliptic, very shortly and obtusely apiculate, *c.* 4.5 mm long and 3 mm wide; labellum lamina fleshy, obovate, obtuse, *c.* 2 mm long and wide. Spur subglobose, *c.* 2 mm long. Column *c.* 1.6 mm long. **Fig. 7.**

***Additional specimens examined*: Indonesia.** Papua Province: Okwalimkam, river headwaters, June 1967, *Ridsdale & Galore NGF33197* (LAE). **Papua New Guinea**. Enga Province: Laiagam, Mar 1983, *Reeve 1051* (K). Southern Highlands Province: Tari Distr., Komo Subd., Eanda, Jul 1980, *Reeve 2587* (K, NSW).

***Distribution and habitat*:** Indonesia (Papua Province); Papua New Guinea. Lower montane forest, 1220–2200 m.

***Notes*:** *Glomera pseudomonanthos* is a very distinctive species easily recognised by its

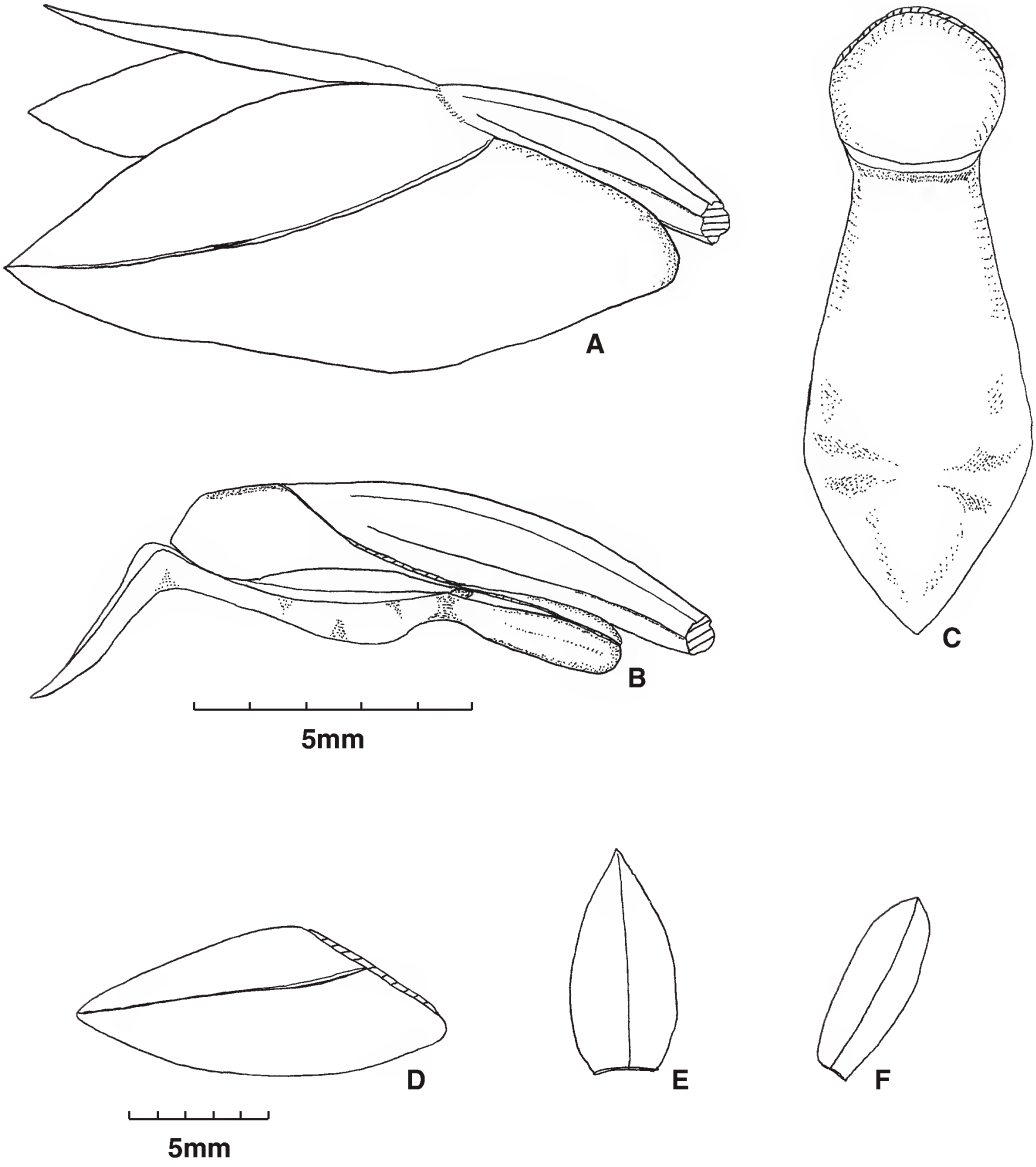


Fig. 6. ***Dendrobium paragnomus.*** A. lateral view of flower. B. lateral view of flower minus sepals and petals. C. adaxial view of labellum. D. adaxial view of lateral sepal. E. adaxial view of dorsal sepal. F. adaxial view of petal. All from *Stocker sub Ormerod 23* (BRI). A-C and D-F to respective scales.

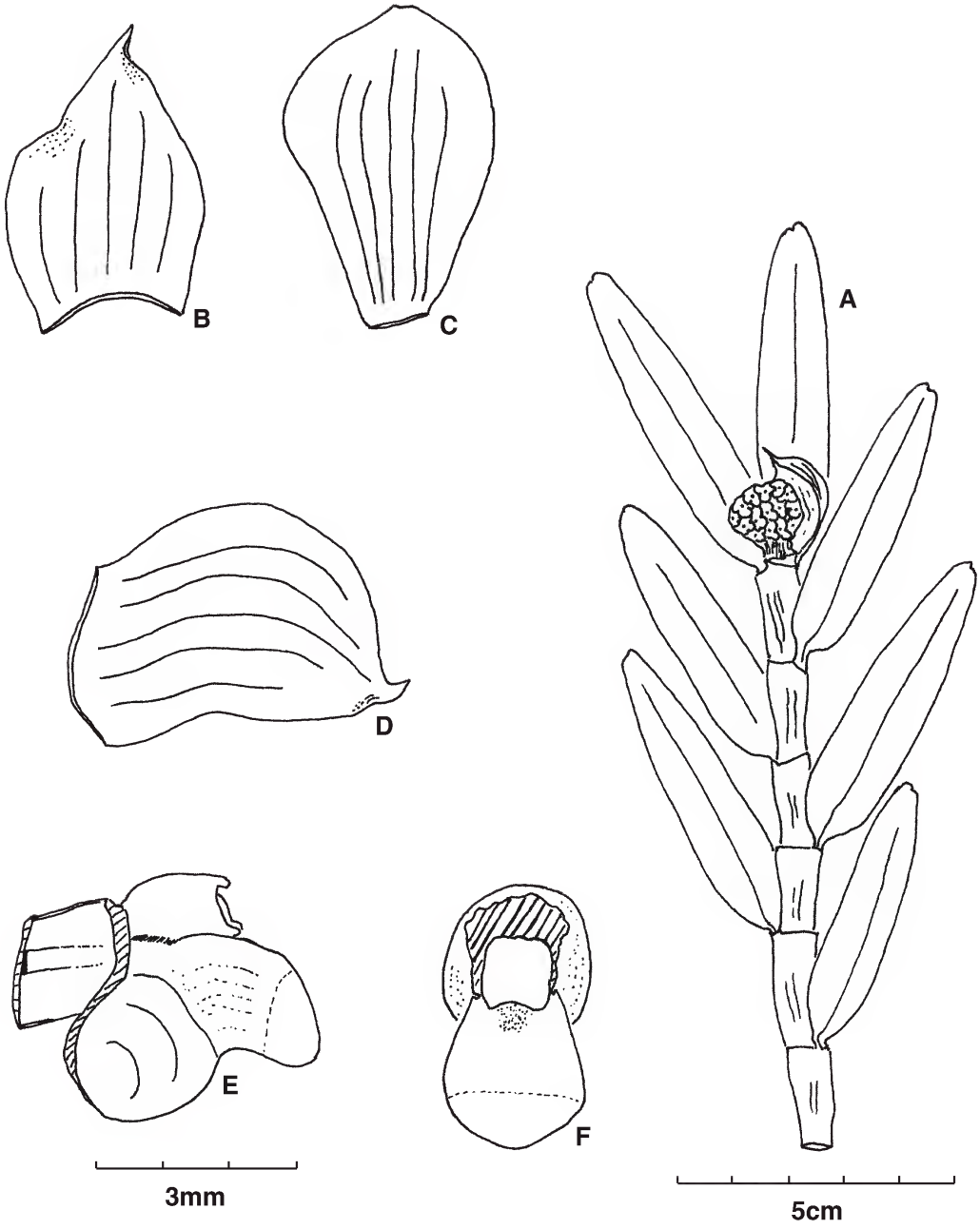


Fig. 7. ***Glomera pseudomonanthos.*** A. plant with apical inflorescence. B. adaxial view of dorsal sepal. C. adaxial view of petal. D. adaxial view of lateral sepal. E. lateral view of flower minus sepals and petals. F. adaxial view of labellum and spur. A from *Millar NGF23408 (LAE);* B-F from *Ridsdale & Galore NGF33197 (LAE).* A and B-F to respective scales.

flattened stems and leaf sheaths, oblong leaves and white flowers with a green lip and darker apex. Only *G. subpetiolata* Schltr. appears to be closely related, this has more slender stems, narrower leaves and white flowers with only the apex of the lip dark green. One collection of *G. subpetiolata* was available for comparison, it was collected near Bupu Village in Morobe Province, Papua New Guinea [*Millar NGF22613* (LAE)].

***Etymology*:** The specific epithet is derived from the Greek compound *pseudo* (false) and *monanthos*, from the compound *mono* (one), and *anthos* (flower). This is in reference to the vegetative habit that resembles that of certain *Dendrobium* species in sect. *Biloba* J.J.Sm. (formerly sect. *Monanthos* Schltr.).

Pseuderia Schltr.

In New Guinea fourteen described species may be recognized in this genus. Yukawa *et al.* (1993, 1996) have argued for the removal of this genus from the *Dendrobiinae* based on chloroplast DNA restriction site variation and rbcL sequences. I agree with Yukawa and his colleagues since there is also good morphological evidence for such a proposal. *Pseuderia* differs from all *Dendrobiinae* in possessing convolute leaves, an elongated column lacking a columnfoot and the incompletely divided pollinia. Yukawa *et al.* (1993, 1996) suggest placing *Pseuderia* in the *Podochileae,* but admit (1996: 173) that there is a lack of evidence to support such a move.

The following species is easily recognised among the known taxa in New Guinea by its narrow lanceolate leaves.

Pseuderia takeuchii Ormerod **sp. nov.**

Species nova *P. brevifolio* J.J.Sm. affinis sed foliis 3-5plo angustioribus, floribus rubro-brunneis et labello prope apicem area densa pubescenti praedito differt. **Typus:** Papua New Guinea. East Sepik Province: Sitipa River headwaters, near Gahom Village, 5 September 1990, *W. Takeuchi 6632* (holo: BRI; iso: AMES).

Epiphytic herb. Roots and lower part of plant not seen. Stem terete, branching, laxly foliose, part preserved 32 cm long, in lower part to 3.5 mm thick, in upper part 1–1.75 mm thick; internodes 4–16 mm long, averaging 8 mm long on branchlets. Leaves lanceolate, acute, thin, 48.5–60.5 mm long and 3–5.5 mm wide; leaf sheaths striate, minutely black-brown hairy. Inflorescences to 5 mm long, arising suboppositely to leaf lamina, probably successively one-flowered. Flowers resupinate; pedicel plus ovary terete, *c.* 6.5 mm long, red-brown. Dorsal sepal linear-ligulate, obtuse, triveined, *c.* 12 mm long and 2 mm wide; lateral sepals falcate, ligulate, apiculate, triveined, *c.* 10 mm long and 2.5 mm wide. Petals slightly falcate, linear-ligulate, obtuse, triveined, *c.* 9 mm long and 1.6-1.75 mm wide; labellum obovate-oblanceolate, obtuse, apical third laxly pubescent becoming densely pubescent, lower half with a keel canaliculate (appearing bicarinate) for *c.* 3 mm before it becomes unicarinate, in total lip *c.* 8 mm long and 3.5 mm wide, at very base *c.* 0.5 mm wide where attached. Column slender, gently arcuate, *c.* 5.5 mm long. **Fig. 8.**

***Distribution and habitat*:** Papua New Guinea (East Sepik Province). Alluvial forests with a tall canopy in the flood zone of the river, *c.* 100 m.

***Notes*:** This species is similar to *Pseuderia brevifolia* J.J.Sm. (also from the New Guinea north coast) in having short leaves; however, it differs from that plant in having the leaves 3–5 times narrower, red-brown flowers and a lip with a dense pubescent patch near its apex. In *P. brevifolia* the leaves are wider (1.3–1.9 cm wide), the flowers are yellowish with red to violet dots and the lip is loosely papillose to pubescent.

***Etymology*:** The specific epithet honours W. Takeuchi, collector of the type specimen.

Robiquetia Gaud.

Five species of this genus are recognised as occurring in New Guinea, these are: *R. ascendens* Gaud. (Syn.: *Saccolabium mooreanum* Rolfe), *R. camptocentrum* (Schltr.) J.J.Sm., *R. flexa* (Rchb.f.) Garay (Syn.: *Ornithochilus moretonii* F.M.Bailey), *R. gracilistipes* (Schltr.) J.J.Sm. and *R. hamata* Schltr. Besides the one described below there appears to be at least one more new taxon that occurs on New Ireland; however, material is insufficient to describe it at this time.

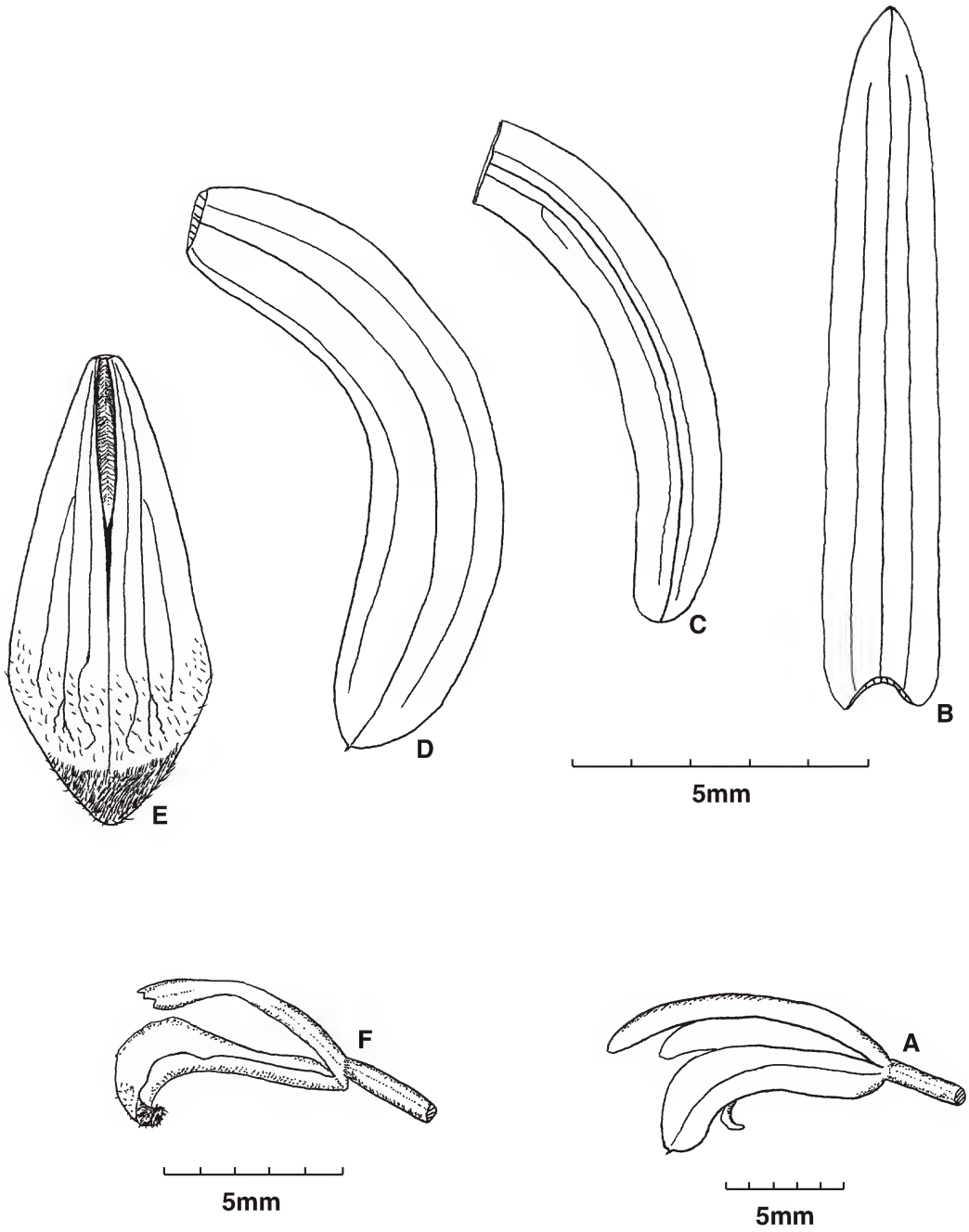


Fig. 8. ***Pseuderia takeuchii.*** A. lateral view of flower. B. adaxial view of dorsal sepal. C. adaxial view of petal. D. adaxial view of lateral sepal. E. adaxial view of labellum. F. column and labellum, the latter unequally folded longitudinally due to pressing. All from *Takeuchi 6632* (BRI). A, B-E and F to respective scales.

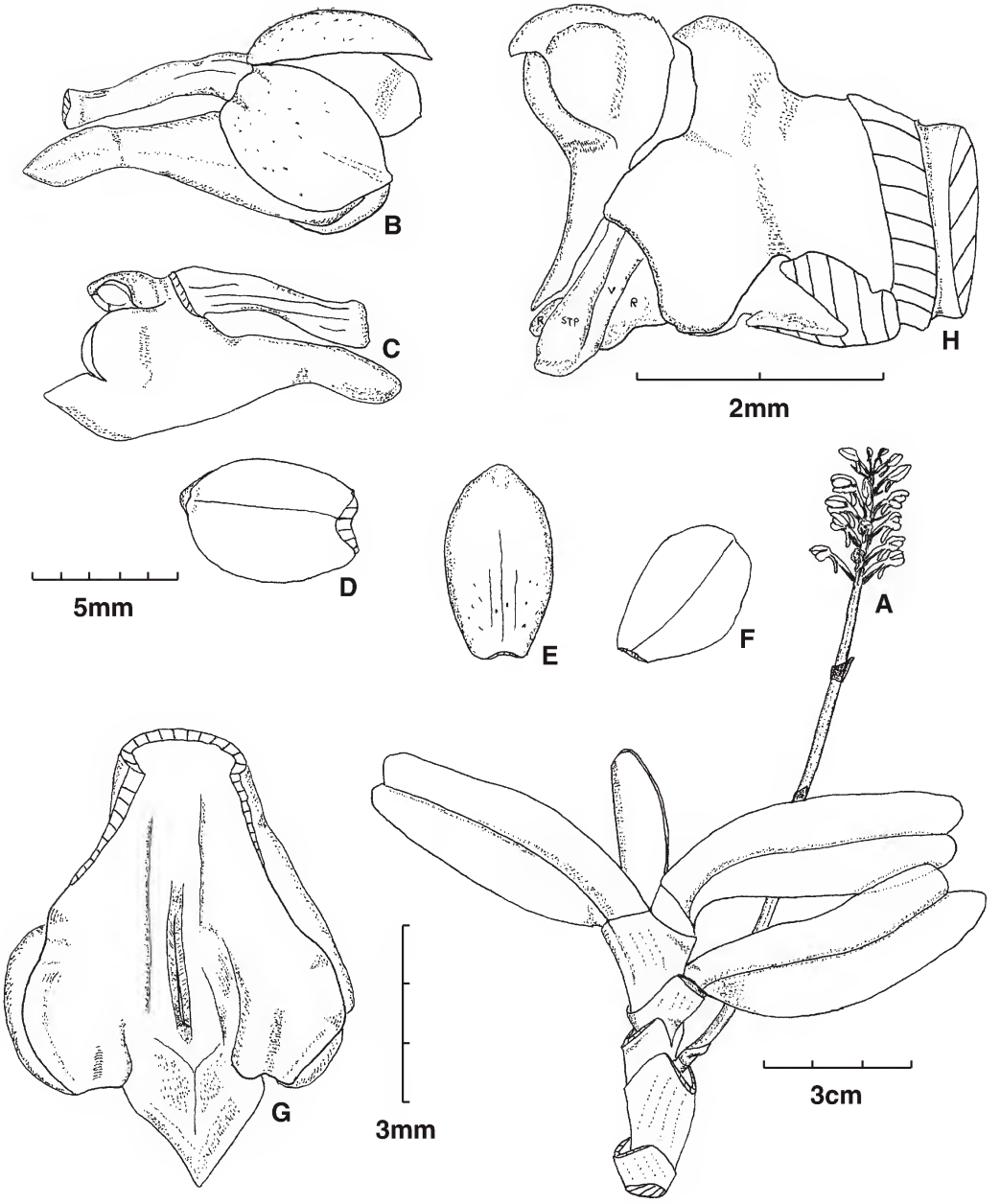


Fig. 9. ***Robiquetia brassii*****.** A. plant with flowering inflorescence. B. lateral view of flower. C. lateral view of column and labellum. D. adaxial view of lateral sepal; E. abaxial view of dorsal sepal. F. adaxial view of petal. G. adaxial view of labellum. H. adaxial view of column (r=rostellum, stp=stipes, v=viscidium). A from *Brass 11716 (BRI);* B-H from *Kalkman & Nicolas 4159 (AMES).* A, B-F, G and H to respective scales.

Robiquetia brassii Ormerod **sp. nov.**

Species nova affinis *R. camptocentrum* (Schltr.) J.J.Sm. sed floribus labello epichilo adaxialiter ecalloso non bicalloso differt. **Typus:** Indonesia. PAPUA PROVINCE: Balim River, December 1938, *L.J. Brass 11716* (holo: BRI; iso: AMES).

Epiphytic herb. Stem elongate, leafy, at least 15–24 cm long and 0.5–0.85 cm thick but 1.3–2 cm wide across top of sheaths. Roots terete, elongate, at least 27 cm long and 0.3–0.4 cm thick. Leaves 3–7 or more, oblong to ligulate, thickly coriaceous, emarginate to obliquely truncate, lobes obtuse to truncate, from *c.* 6 cm long and 2.1 cm wide to *c.* 23 cm long and 3.6 cm wide; sheaths obliquely truncate opposite leaf lamina, 1.5–4.4 cm long. Inflorescences 13.5–30 cm long, to 0.4 cm thick; peduncle 11–19 cm long; peduncular sheaths three, scattered, tubular, clasping, acute, 0.7–1.35 cm long; rachis 2.5–11 cm long, densely 15 to many-flowered; floral bracts ovate-lanceolate, acute, 0.5–1 cm long and 0.2–0.3 cm wide. Flowers resupinate; pedicel plus ovary cylindric to weakly clavate, laxly covered in short scales, 5.5–6 mm long; sepals and petals fleshy, red to dirty purple. Dorsal sepal obovate-elliptic, obtuse, concave, trinerved, 4.5–6 mm long and 2.5–3.5 mm wide, sparsely covered in short scales outside; lateral sepals broadly oblique-elliptic, obtuse, 4–6 mm long and 2.8–4 mm wide, sparsely covered in short scales outside. Petals obovate-elliptic, obtuse, 1–2-nerved, 4–5.5 mm long and 3–4 mm wide; labellum trilobed, spurred, connate to ventral sides of the column for *c.* 1 mm, 4–5 mm long and 5–6.5 mm wide; hypochile with broadly rounded sidelobes 2–3.5 mm long and 2–2.5 mm wide, each inside at front with a fleshy callosity *c.* 1 mm long, between sidelobes a low short median keel terminating at the epichile base; epichile fleshy, ovate, subacute, 1.5–2 mm long; spur conical-cylindric, acute to obtuse, straight to gently geniculate, 5–10 mm long. Column short, stout, hamate, *c.* 2 mm long and 1.5–2.5 mm wide laterally. **Fig. 9 & 10.**

***Additional specimen examined*: Indonesia.** PAPUA PROVINCE: Star Mts., Sibil Valley, May 1959, *Kalkman & Nicolas 4159* (AMES).

***Distribution and habitat*:** Indonesia (Papua Province). Lower montane forest, epiphyte on riverbank trees (both records), 1200–1600 m.

***Notes*:** This species is closely related to *Robiquetia camptocentrum* (Schltr.) J.J.Sm. *R. brassii* is distinguished by the fleshy, entire labellum epichile which is not split medially above with each side thickened into an ovoid to globose callosity. Furthermore, in *R. camptocentrum* a distinct sinus is present between the lateral lobes and the epichile whilst when these are viewed laterally in *R. brassii* this sinus is absent.

Robiquetia hamata is also very similar to *R. brassii* that also occurs in the Indonesian province of Papua [*Eyma 4718* (AMES, BRI, K) from Wissel Lakes]. However; in *R. hamata* the labellum epichile is split medially above with diverging margins and it is hollowed out like the bow of a boat whilst in *R. brassii* the epichile is solid.

The holotype of *R. brassii* is a small-leaved portion of the plant whilst the isotype in AMES and the other known collection have leaves 3-4 times as long. In rehydrated material the flowers appear to have a thickened median line on the exterior of the sepals but this feature is probably an artifact of drying associated with the fleshy flowers.

***Etymology*:** The specific epithet honours L.J.Brass, collector of the type specimen.

Tainia Blume

If *Tainia* is interpreted in the strict sense then only one species has been recognised as occurring in New Guinea until now. The first taxon reported from New Guinea was *Tainia trinervis* (Blume) Rchb.f. which was at first described by Schlechter under the name *T. parviflora.* It is now known to occur in the Moluccas, New Guinea, Bougainville and northeast Australia.

The second species that is described below, was first recognised by Mr. Walter Kittredge (HUH) but due to an oversight, the single collection was not loaned when the genus was monographed by Turner (1992).

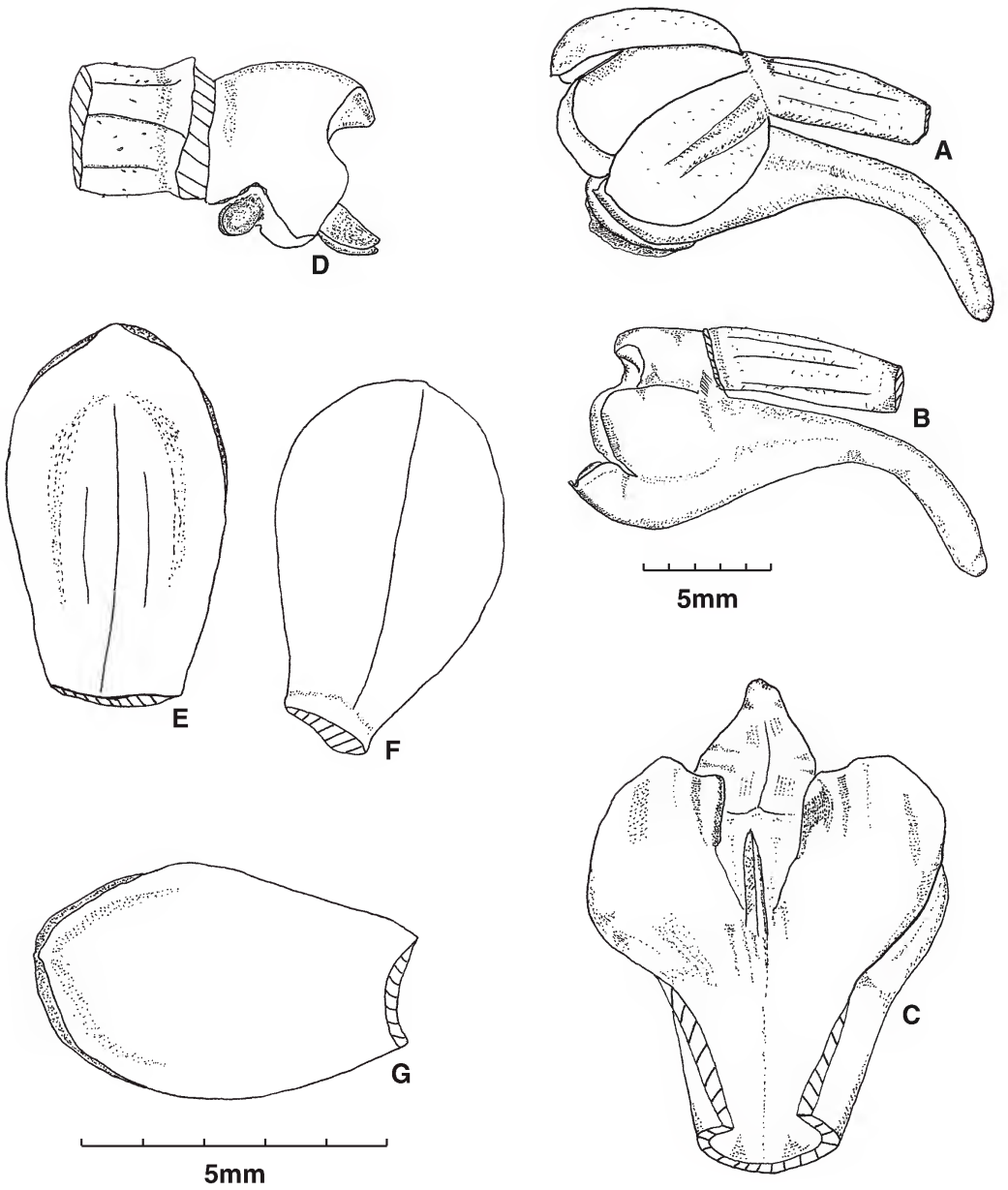


Fig. 10. ***Robiquetia brassii.*** A. lateral view of flower. B. lateral view of labellum and column (minus anther and pollinarium). C. adaxial view of labellum. D. lateral view of column minus anther with pollinia on the stigma. E. adaxial view of dorsal sepal. F. adaxial view of petal. G. adaxial view of lateral sepal. All from *Brass 11716* (AMES). A, B and C-G to respective scales.

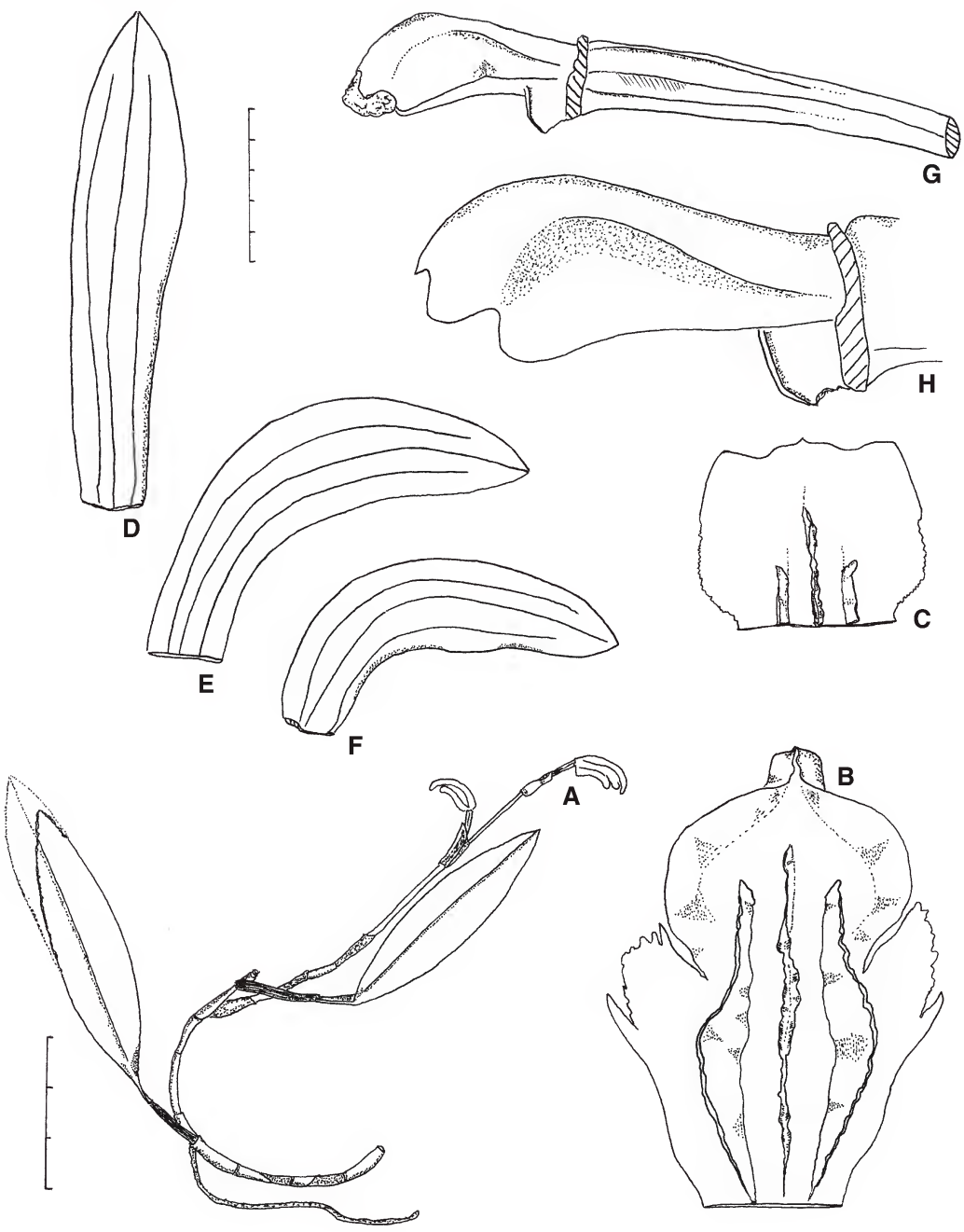


Fig. 11. ***Tainia serratiloba.*** A. plant with flowering inflorescence. B. adaxial view of labellum. C. adaxial view of spread epichile. D. adaxial view of dorsal sepal. E. adaxial view of petal. F. adaxial view of lateral sepal. G. lateral view of column. H. lateral view of column minus anther and with wings spread out. All from *Brass 12308* (AMES). A and D-G to respective scales. B, C, H not to scale.

Tainia serratiloba Ormerod **sp. nov.**

Planta pro genere pusilla, inflorescentiis pauciflora, floribus labello trilobatis tricarinatis et lobis lateralibus erosolaceratis. **Typus:** Indonesia. Papua Province: 15 km SW of Bernhard Camp, Idenburg River, January 1939, *L.J. Brass 12308* (holo: AMES).

Epiphytic herb. Roots few, elongate. Rhizome terete, internodes 8–11 mm long and 1–3 mm thick; rhizome sheaths tubular, clasping, obliquely truncate, *c.* 7 mm long. Pseudobulbs 30–40 mm apart, narrowly conical-cylindric, unifoliate, fused(?) to rhizome for up to 7.5 mm, up to 12.5 mm long and 2 mm thick. Leaves ovate-lanceolate to oblong-lanceolate, acute, 13-nerved, 48–66 mm long and 11–14 mm wide. Inflorescences 62–130 mm long; peduncles resembling pseudobulbs basally, 59–75 mm long and to 2 mm thick; sheathing bracts three, laxly spaced, tubular, obliquely truncate, acute, 8–15 mm long; rachis laxly 1–4-flowered, 21–55 mm long; floral bracts tubular, obliquely truncate, acute, 6.5–9.5 mm long. Flowers resupinate; pedicel plus ovary narrowly clavate, 9–12.5 mm long; sepals brown with yellow tips, lip white. Dorsal sepal ligulate-oblanceolate, acute, *c.* 15.5 mm long and 3.5 mm wide; lateral sepals falcate, oblong-ligulate, acute, median nerve weakly carinate externally, *c.* 10 mm long and 2.8 mm wide. Petals oblong-ligulate, falcate, acute, *c.* 13 mm long and 3.25 mm wide; labellum trilobed, *c.* 7.5 mm long and 6 mm wide, with three subcrispate-undulate keels each grooved on the upper edge; hypochile *c.* 4.5 mm long, with obliquely subquadrate, erose-lacerate sidelobes *c.* 1 mm long and 2 mm wide; epichile subquadrate, minutely apiculate, *c.* 3 mm long and 4.5 mm wide. Column broadly winged, without anther *c.* 6.5 mm long, c. 3 mm wide laterally at apex, *c.* 1.2 mm wide laterally near base, lobe of columnwings *c.* 0.9 mm wide; pollinia eight. Capsule *c.* 26 mm long and 6.5 mm thick with pedicel 10 mm long. **Fig. 11.**

***Distribution and habitat*:** Indonesia (Papua Province). Lower montane forest, rainforest gully, *c.* 1750 m.

***Notes*:** This plant superficially resembles *Collabium pumilum* (J.J.Sm.) Seidenf. from Sulawesi in habit, presumably because it has also adapted to a montane mossy habitat. *Tainia serratiloba* does not appear to have any close relatives in *Tainia* and stands alone in the genus.

***Etymology*:** The specific epithet is derived from the Latin *serratus* (serrated or notched), and the Latin compound *lobus* derived from the Greek *lobos* (a lobe or pod), in reference to the serrated lateral lobes of the labellum.

Acknowledgements

I wish to thank W. Kittredge (HUH), G. Romero (AMES), G. Stocker, D.L. Szlachetko and T. Yukawa (TNS) for their help with various matters. The Directors of the cited herbaria allowed access to collections in their care. P. Bostock (BRI) contributed the majority of the Latin diagnoses whilst R.J.F. Henderson (ex BRI) contributed the Latin diagnoses of *Glomera pseudomonanthos* and *Robiquetia brassii.*

References

Chadim, V.A. (1972). *Dendrobium macrophyllum* A.Rich. *Orchadian* 4: 25–31.

Cribb, P.J. (1983). A revision of *Dendrobium* sect. *Latouria*. *Kew Bulletin* 38: 229–306.

Dauncey, E.A. (2003). A taxonomic revision of *Dendrobium* section *Pedilonum* (Orchidaceae). *Harvard Papers in Botany* 7: 151–320.

Greuter, W., McNeill, J., Barrie, F.R., Burdet, H.M., Demoulin, V., Filgueiras, T.S., Nicolson, D.H., Silva, P.C., Skog, J.E., Trehane, P., Turland, N.J. & Hawksworth, D.L. (2000). International Code of Botanical Nomenclature (Saint Louis Code). *Regnum Vegetabile* 138: 1–474.

Kraenzlin, F. (1910). Orchidaceae-*Monandreae-Dendrobiinae* Part I. In A.Engler (ed.), *Das Pflanzenreich* IV. 50. II. B. 21, 45: 1–382.

Lavarack, P.S., Harris, W. & Stocker, G. (2000). *Dendrobium and its Relatives.* Kangaroo Press: Roseville East.

Ormerod, P. (1995). Complementary studies of Solomon Archipelago orchids. *Australian Orchid Review* 60: 35–39.

Ormerod, P. (2002). Notes on the orchids of New Guinea and the Pacific. Part 7. *Oasis (Dora Creek)* 2(3): 8–9, 12.

Ormerod, P. (2003). Papuasian Orchid Studies. *Oasis (Dora Creek)* 3(4): 3–6.

Reichenbach, H.G. (1861). Index. In W.G. Walpers (ed.), *Annales Botanices Systematicae* 6: 1150.

Schlechter, R. (1912). *Dendrobium* Sw. *Repertorium specierum novarum regni vegetabilis, Beihefte* 1: 440–643.

Seidenfaden, G & Pedersen, H.AE. (2003). Contributions to the orchid flora of Thailand XIV. *Nordic Journal of Botany* 22: 525–534.

Schuiteman, A. & De Vogel, E.F. (2001). *Orchids of New Guinea. Vol. I. Illustrated Checklist and Genera.* CD-ROM. ETI/National Herbarium of the Netherlands: Leiden.

Turner, H. (1992). A revision of the orchid genera *Ania, Hancockia, Mischobulbum* and *Tainia. Orchid Monographs* 6: 43–100 + figures.

Van Royen, P. (1979). Orchidaceae. In *The Alpine Flora of New Guinea.* 2: 51–811. J.Cramer: Vaduz.

Yukawa, T., Kurita, S., Nishida, M. & Hasebe, M. (1993). Phylogenetic implications of chloroplast DNA restriction site variation in Subtribe *Dendrobiinae* (Orchidaceae). *Lindleyana* 8: 211–221.

Yukawa, T., Ohba, H., Cameron, K.M. & Chase, M.W. (1996). Chloroplast DNA phylogeny of Subtribe *Dendrobiinae* (Orchidaceae): Insights from a combined analysis based on *rbcL* sequences and restriction site variation. *Journal of Plant Research* 109: 169–176.

Goodenia elaiosoma I.D.Cowie (Goodeniaceae), a new species from the Top End of the Northern Territory and a key to the northern species

Ian D. Cowie

Summary

Cowie, I.D. (2005). *Goodenia elaiosoma* I.D.Cowie (Goodeniaceae), a new species from the Top End of the Northern Territory and a key to the northern species. *Austrobaileya* 7(1): 205–213. The new species *Goodenia elaiosoma* I.D. Cowie (*Goodenia* section *Goodenia*, subsection *Borealis*) is described from the western Top End of the Northern Territory. The species is compared with the superficially similar, tropical species *G. armstrongiana* and *G. debilis*. A key to the 43 *Goodenia* species found in the northern Northern Territory is provided.

Key Words: Goodeniaceae, *Goodenia elaiosoma, Goodenia armstrongiana, Goodenia debilis,* new species, key to species, Northern Territory, tropical Australia.

I.D.Cowie, Northern Territory Herbarium, Department of Natural Resources, Environment and the Arts, P.O. Box 496, Palmerston Northern Territory 0831, Australia.

Introduction

The seasonally waterlogged, infertile, sandy soils of the monsoonal northern Northern Territory (NT) support a diverse assemblage of specialist plant species. Indeed, the area has been identified as a world centre of diversity for the genus *Utricularia* L. (Lentibulariaceae) (Taylor 1989) with 36 taxa known from the area. This diversity is also reflected in other genera associated with such soils including *Eriocaulon* L. with 21 species in the northern NT (Leach 2000) and *Lindernia* All. (under revision but more than 25 taxa in the northern NT (W.R. Barker unpublished data). To a greater or lesser degree, speciation has also occurred in genera such as *Byblis* Salisb. *Calandrinia* Kunth, *Centrolepis* Labill., *Drosera* L., *Fimbristylis* Vahl, *Mitrasacme* Labill., *Oldenlandia* L., *Stylidium* Willd., *Trithuria* Hook.f., and *Typhonium* Schott occurring on seasonally water logged substrates and extends to the wetter end of the drainage continuum with local speciation in shallow water, aquatic genera such as *Hygrochloa* Lazarides and *Nymphoides* Hill. Many of the taxa involved are endemic to the NT, with relatively restricted distributions on the lowlands primarily associated with the Koolpinyah Surface of Williams (1969) or the Western Arnhem Land Plateau (Woinarski *et al.* in prep.). The species composition of this flora appears to vary in response to subtle changes in the texture, drainage and period of inundation of these colluvial and alluvial sandy soils found in drainage depressions, on upstream floodplains, along minor drainage lines and in seepage areas.

In the Darwin area, these soils are extensively exploited as a source of fine sand for building and construction (Doyle 2001) and the long-term conservation status of the flora they support is of some concern. During surveys of this flora in the Darwin-Kakadu area to clarify the distribution, abundance and conservation status of *Utricularia* species in particular, collections were made of an undescribed *Goodenia* Sm. This taxon, although allied to *G. armstrongiana* de Vriese and *G. debilis* A.E.Holland & T.P.Boyle, has characters which clearly set it aside from those species and is described here.

Goodenia Sm. is a genus of *c.* 190 species almost endemic to Australia and occurring in all States and Territories. Seventy-two species are known from the NT. The genus has recently been treated for Australia by Carolin (1990; 1992), although no treatment exists specifically for the NT. A key to the 43 *Goodenia* species found in the NT north of 17° S latitude is provided here to assist with their identification.

Accepted for publication 10 August 2005

Materials and methods

Morphological characters were examined using fresh and dried material at DNA. Floral characters were primarily measured from rehydrated and spirit-preserved material with supplementary measurements of dried flowers.

The terminology used for *Goodenia* follows that generally accepted for the genus (Carolin 1990, 1992; Holland & Boyle 2002). In particular, the more or less reduced cauline leaves or scales which subtend the flowers are termed bracts. Appendages (bracteoles) may also be present on the flower stalk, which if ebracteolate is termed a pedicel. Where bracteoles are present, that part below the bracteole is termed a peduncle and the part above a pedicel. The term calyx lobes is used here to describe the free parts of the calyx, otherwise known as sepals in the literature. The adaxial corolla lobes are those either side of the split in the side of the corolla tube while the abaxial corolla lobes are the three more connate lobes between them. Species in the key are numbered according to the *Flora of Australia* treatment (Carolin 1992), to allow easy reference to descriptions there and users of the key are referred to that treatment for authors of plant names.

Taxonomy

Goodenia elaiosoma I.D. Cowie, **sp.nov.** Arcte affinis *G. debili* A.E. Holland & T.P. Boyle a corolla purpureo-brunnea et praecipue a semine oblongo cum hilo basali et elaiosomate, sed sine labro a qua differt. **Typus:** Northern Territory. E of Hope Inlet, 12° 25'S, 131° 06'E, 3 June 2000, *I.D. Cowie 8891* (holo: DNA; iso: AD, B, BRI, CANB, K, L, MEL, MO, NSW, NY, PERTH).

Decumbent annual *herb*, stems to 70 cm long, base single stemmed, softly spongy. *Indumentum* of white to stramineous, straight, antrorse, closely appressed hairs 0.3–0.7 mm long, sparse on stems, pedicels, leaf undersurfaces and capsules, more dense on new growth, ovary, calyx and exterior of floral tube; inner surface of corolla in lower half with fine, weak, hyaline hairs. *Leaves* alternate, antrorse, all cauline, sessile, linear, 6–35 mm long, 1–2 mm wide, gradually diminishing in length towards the stem apex, glabrous above, margins entire, slightly recurved. *Inflorescence* a bracteate raceme. *Flowers* solitary; bracts foliaceous; pedicels filiform, patent, 10–18 mm long, bracteoles absent. *Sepals* adnate to ovary almost to apex; lobes linear, 1.0–1.7 mm long. *Corolla* 5–7 mm long, purple brown, end of lobes and wings cream to dark maroon, enations absent, pouch absent; tube 1.2–1.9 mm long; *abaxial lobes* narrowly oblong, 3.3–4 mm long, *c.* 0.8 mm wide, free for 1.7–2.5 mm, wings equal, 1.3–1.7 mm long, 0.8–1.3 mm wide, minutely serrate to erose; *adaxial lobes* free, narrowly oblong, auricle 1–1.3 mm long, *c.* 0.7 mm wide, wings strongly unequal, wing above auricle usually rudimentary for most of its length, 0.5–1.7 mm long, 0.1–0.5 mm wide, opposite wing well developed, 1.2–1.5 mm long, 0.7–1 mm wide, minutely serrate to erose. *Stamens* 2.1–2.3 mm long; filaments linear, 1.4–1.8 mm long; anthers narrowly oblong, 0.4–0.5 mm long, apiculate. *Style* 2.2–2.7 mm long, indusium broadly obovate, 0.6–1 mm long, 0.8–1 mm wide, basal tuft of hairs absent, sometimes with a few subapical hairs to 0.5 mm long, otherwise glabrous, apex concave, bristles 0.1–0.5 mm long, to 0.5 mm long on upper (abaxial) lip. *Ovary* inferior; ovules 6–7. *Capsule* ellipsoidal, 3.7–4.5 mm long, dehiscing deeply. *Seed* stramineous, oblong, biconvex in cross-section, 1.4–2.0 mm long, 0.9–1.1 mm wide, smooth, glossy, obscurely areolate, rimless, wing absent, base asymmetric with a hyaline elaiosome. **Fig. 1.**

***Additional specimens examined*: Northern Territory.** Wangi Road, near Finniss River crossing, 12° 58'S, 130° 45'E, May 2004, *Cowie 9993 & Jacka* (BRI, CANB, DNA, L, NT, MEL, MO); Shoal Bay area, E of Hope Inlet, NT, 12° 25'S, 131° 06'E, May 2000, *Cowie 8885 & Kerrigan* (BRI, CANB, DNA, MEL, MO, NSW); Howard River Floodplain, 12° 28'S, 131° 06'E, May 2001, *Kerrigan 341 & Cowie* (DNA, MEL); 19 km NNW of Twin Falls, 13° 08'S, 132° 45'E, Jun 1980, *Craven 6293* (DNA).

***Distribution and habitat*:** Endemic to the northern NT and known from Finniss River southwest of Darwin to Kakadu National Park (**Map 1**). Grows in *Eriachne burkittii* grassland/sedgeland or *Pandanus* low open woodland, on the margins of non-estuarine floodplains or in seasonally inundated drainage depressions, on sandy substrates.

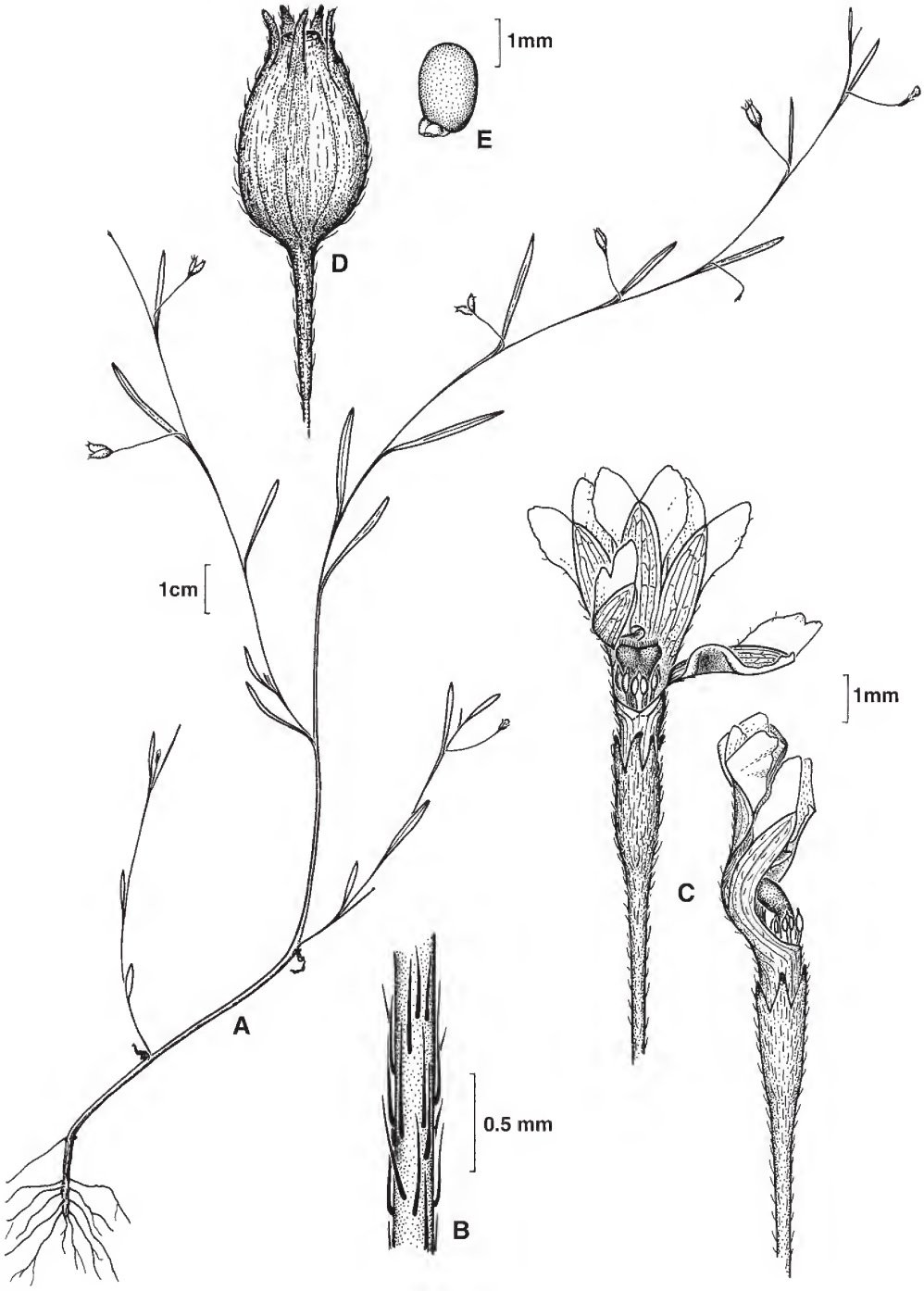
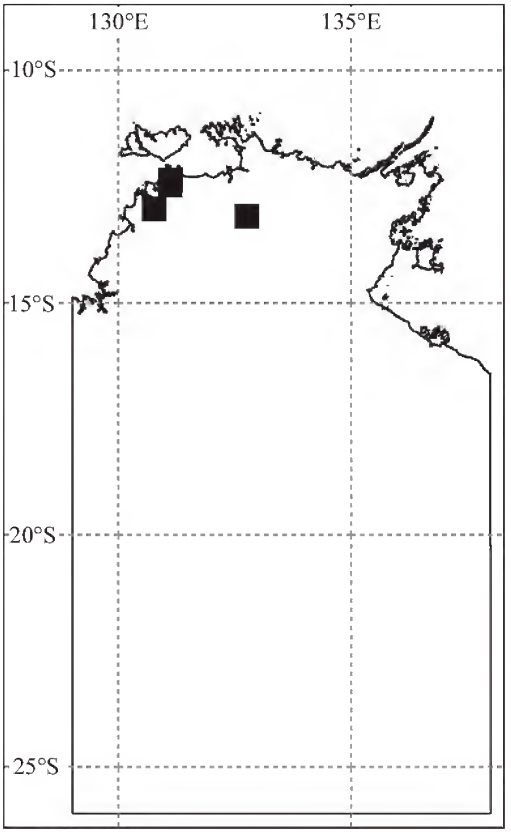


Fig. 1. ***Goodenia elaiosoma.*** A. habit. B. indumentum of stem. C. flower. D. capsule. E. seed. all from *Cowie 8891* (DNA). Scale bars: A. 1 cm; B. 0.5 mm; C, D, E.1 mm. Del. M. Osterkamp Marsden.



Map 1. Distribution of *Goodenia elaiosoma* in the NT.

***Phenology*:** Flowering and fruiting are recorded from April to June.

***Notes*:** *Goodenia elaiosoma* is most closely related to *G. debilis* but differs in having purple-brown flowers and particularly in the seed which is oblong, lacks a rim and has a basal hilum and elaiosome (**Fig. 2**). *G. debilis* has cream or yellow flowers with brownish markings and the seed is elliptic to elliptic-lanceolate, has a narrow rim, with the hilum obliquely lateral at base (**Fig. 2**). Although specimens of both *G. debilis* and *G. armstrongiana* have a narrow membrane around the hilum, this is apparently air-filled and not filled with oily material as in *G. elaiosoma*. *G. elaiosoma* shares with *G. debilis* narrow entire leaves, a shorter corolla, few ovules and an appressed indumentum. Both species lack the prominent basal tuft of hairs on the indusium.

Goodenia elaiosoma differs from *G. armstrongiana* especially by the reduced wing on the adaxial corolla lobes, purple-brown corolla, and the smaller, essentially smooth, oblong, biconvex, rimless, glossy seed with a basal elaiosome. Other differences include the stem which is single and softly spongy at the base; linear leaves; straight, closely appressed indumentum; indusium lacking an often prominent basal tuft of hairs; usually smaller corolla, and fewer ovules. Although variable in leaf dimensions and flower colour, *G. armstrongiana* is characterised *interalia* by antrorse leaves which are more or less dentate, often with basal auricles, a sparse indumentum of curved, appressed to ascending strigose hairs, long filiform peduncles, white to yellow corolla, an indusium with a prominent basal tuft of hairs to 1.5 mm long and seeds which are obovate-oblong to oblanceolate, flattened, verrucate, with a well developed rim, the hilum obliquely lateral at the base (**Fig. 2**). This species is multistemmed at the base with wiry stems. *G. elaiosoma* is sometimes sympatric with *G. armstrongiana* (e.g. at Finniss River), where both species maintain their identities without forming hybrids. Populations of *G. elaiosoma* are geographically disjunct from those of the north Queensland *G. debilis*.

Like *Goodenia armstrongiana* and *G. debilis*, *G. elaiosoma* belongs in *G.* section *Goodenia*, subsection *Borealis* Carolin (Carolin 1992).

***Conservation status*:** The species is known from five locations, with a range extending some 250 km. Two populations fall within Shoal Bay Conservation Reserve east of Darwin while a third lies in Kakadu National Park. A fourth population is known from an area previously disturbed by mining. Although plants at each population were locally common, with plants at Finniss River abundant and estimated at approximately 1 plant m^2 over an area of several hectares, little is known of the true size and extent of populations. Outside of the two reserves, the poorly drained sands inhabited by this species in the Darwin area have been extensively taken up for mining and are heavily exploited. Despite extensive survey work in suitable habitat in the Darwin area, no other populations were found. However, large areas

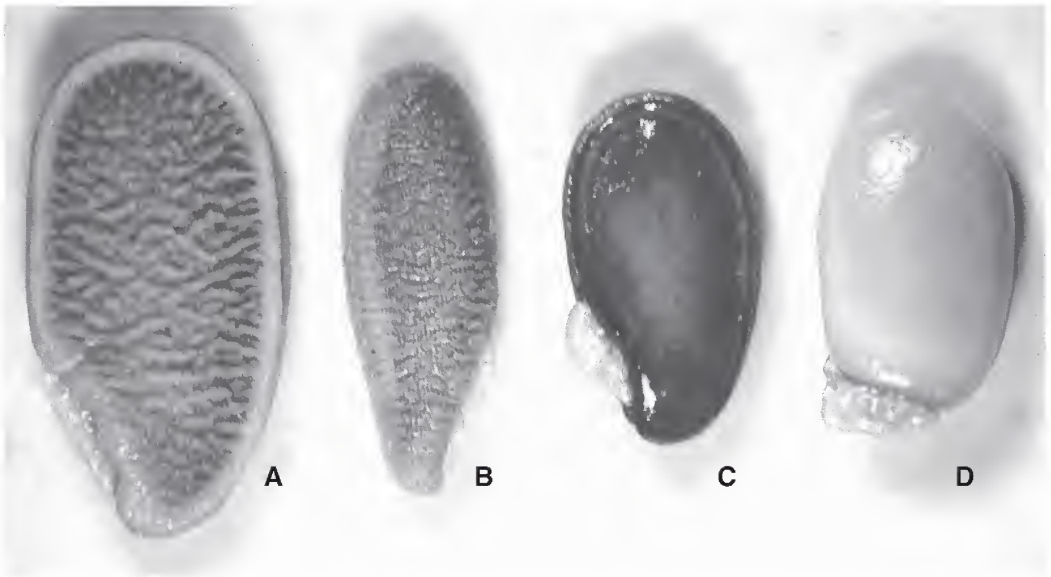


Fig. 2. Seeds of *Goodenia armstrongiana*, *G. debilis* and *G. elaiosoma*. From left to right A. *G. armstrongiana* (*Orr* 222). B. *G. armstrongiana* (*Cowie 8576*). C. *G. debilis* (*Forster 22614*). D. *G. elaiosoma* (*Cowie 8891*).

---

of its range to the east of Darwin and in Kakadu National Park have not been intensively surveyed at an appropriate scale or time of year. Using IUCN criteria, a conservation code of Data Deficient is recommended (IUCN 2001).

***Etymology*:** From the Greek, *elaion* – oil and *soma* – a body, a reference to the elaiosome found on the seed.

Key to *Goodenia* species in the Northern Territory north of 17°S latitude

Species in the key are numbered according to the *Flora of Australia* treatment (Carolin 1992), to allow easy reference to descriptions there and users of the key are referred to that treatment for authors of plant names. It is recognized that a number of complexes are in need of further study (e.g. *G. janamba* Carolin – *G. coronopifolia* R.Br., *G. byrnesii* Carolin – *G. malvina* Carolin – *G. campestris* Carolin and *G. leiosperma* Carolin – *G.* sp. Melville Island).

1. Style 2–4 fid . . . . . **GROUP 1**
   Style unbranched 2

2. Herbs with stoloniferous stems or plants compact and cushion-like; flowers 2 mm long or less, dark red to red-purple, lobes equal, wings obsolete or absent . . . . . **GROUP 2**
   Decumbent to erect herbs, stems not stoloniferous; flowers almost always more than 2 mm long, blue, purple-brown to yellow or white; wings usually well developed, rarely absent 3

3. Leaves either mostly clustered on a short rosette-like basal stock or scattered along a short stem; inflorescence distinct with few leaf-like bracts (i.e. scapose or scapiform) . . . . . **GROUP 3**
   Stems foliose throughout or with leaf-like bracts predominant in inflorescence (stems sometimes reduced or sometimes a few basal leaves present) . . . . . **GROUP 4**

GROUP 1

1. Style 4-fid; corolla yellow-brown . . . . . **176. G. quadrifida**
   Style 3-fid; corolla yellow, purple or brownish-purple 2

2. Corolla yellow, at least on wings 3
   Corolla purple or brownish-purple 6

3. Simple hairs predominating on young leaves, bracts and pedicels, rarely almost glabrous . . . . . **160. G. pilosa**
   Glandular hairs predominating on young leaves, bracts and pedicels 4

4. Seeds smooth; corolla with simple strigose hairs outside, a few glandular hairs sometimes present . . . . . **170. G. neglecta**
   Seeds granulate to verrucate; corolla glandular-pubescent outside 5

5. Cauline leaves usually with 1 or 2 acute teeth at the base, thus auriculate; central indusium ovate to broad ovate; corolla (5.5–) 14–20 mm long . . . . **172. G. holtzeana**
   Cauline leaves petiolate or sessile, never with two broad basal teeth; central indusium depressed-ovate; corolla 10–12 mm long . . . . . **173. G. heppleana**

6. Seeds granulate to verrucate; corolla glandular pubescent outside, simple strigose hairs absent . . . . . **175. G. purpurea**
   Seeds smooth; corolla with simple strigose hairs outside, glandular hairs also present 7

7. Glandular hairs numerous and conspicuous on the flower and pedicel; leaves oblanceolate to narrowly oblanceolate; corolla 8–15 mm long . . . . . **174. G. symonii**
   Glandular hairs few and inconspicuous on the flower and pedicel; leaves very narrowly lanceolate to linear; corolla 7–8 mm long . . . . . **168. G. porphyrea**

GROUP 2

1. Leaves to 80 mm long; inflorescence a compact head at ground level **165. G. chthonocephala**
   Leaves to 25 mm long; flowers solitary or in condensed terminal racemes 2

2. Hairs on leaves simple . . . . . **178. G. kakadu**
   Hairs on leaves stellate . . . . . **177. G. pumilio**

GROUP 3

1. Leaves scattered along a short stem 2
   Leaves mostly on a short rosette-like basal stock 3

2. Leaves linear, less than 5 mm wide; capsule cylindrical; seeds reticulate-foveolate . . . . . **13. G. gloeophylla**
   Leaves oblanceolate, more than 10 mm wide; capsule ovoid; seeds colliculate-punctate . . . . . **27. G. scaevolina**

3. Seeds much less than 1 mm diam., numerous in capsule; bracteoles present 4
   Seeds more than 2 mm diam., often few in capsule; bracteoles absent 10

4. Corolla lobes white to purple or blue 5
   Corolla lobes yellow or yellow and purple 8

5. Corolla 2–3(–5) mm long mostly white with pale purple markings; corolla wings almost obsolete; seeds smooth . . . . . **19. G. minutiflora**
   Corolla 4 mm or more long, wings 1–2 mm wide 6

6. Leaves resinous-viscid with glandular and simple hairs; corolla dark purple-blue; capsule 1.5–3 mm long; seeds smooth to reticulate ..... **20. G. viscidula**
Leaves not viscid, glabrous or with simple hairs; corolla almost white to purple; capsule 2–5 mm long; seeds smooth 7

7. Corolla purple to white-mauve, 8–13 mm long, wings 1–2 mm wide .... **18. G. purpurascens**
Corolla bluish-purple, 4–5 mm long; wings *c.* 1 mm wide ..... **21. G. paludicola**

8. Plant annual; scapes with glandular and patent simple hairs; abaxial corolla lobes yellow, adaxial corolla lobes purplish; leaves usually obovate; seeds reticulate-foveolate ..... **16. G. bicolor**
Plant usually perennial; scapes glabrous or only with simple hairs; corolla lobes yellow throughout; leaves mostly linear-lanceolate to linear-oblanceolate; seeds smooth 9

9. Leaf veins obscure; indusium notched and folded longitudinally ..... **11. G. gracilis**
Leaf veins 3, prominent; indusium concave ..... **15. G. lamprosperma**

10. Calyx lobes markedly unequal, adaxial calyx lobe much longer than others; seeds reticulate, wing 0.2–0.4 mm wide; dwarf plant ..... **136. G. redacta**
Calyx lobes all equal, adaxial calyx lobe equal to others; seeds smooth or reticulate, wing to 1 mm wide; erect plant 11

11. Leaves linear to oblong-elliptic, dentate to pinnatisect, lobes acute; indusium obdeltoid; seeds reticulate, wing *c.* 0.5 mm wide ..... **106. G. coronopifolia**
Leaves narrowly oblong to oblanceolate with a few blunt teeth; indusium broadly oblong; seeds smooth, wing *c.* 1 mm wide ..... **130. G. janamba**

GROUP 4

1. Cauline leaves and bracts appressed to stem, antrorse (pointing upwards) ..... **166. G. armstrongiana**
Cauline leaves and bracts spreading to patent, antrorse or not 2

2. Ovary with mostly glandular hairs or calyx lobes attached in lower half of capsule or both 3
Ovary with mostly simple hairs (often tubercular based) or glabrous; calyx lobes attached in upper half of capsule 8

3. Cauline leaves terete or linear, less than 2.5 mm wide 4
Cauline leaves linear to obovate, more than 3 mm wide 6

4. Upper stems strongly flexuose (zig-zag); ovules 4–6; seeds aculeate (covered in prickles), wing 0.1–0.2 mm wide ..... **138. G. cirrifica**
Upper stems more or less straight; ovules more than 20; seeds colliculate (covered with small rounded projections), wing 1 mm or more wide 5

5. Plant single stemmed at base; leaves mostly more than 40 mm long, not viscid and varnished; abaxial corolla lobes often wingless or with reduced wings ..... **141. G. triodiophila**
Plant many-stemmed at base; leaves mostly less than 40 mm long, often viscid and varnished; abaxial corolla lobes with well developed wings . **139. G. armitiana**

6. Annual herb; leaves and stems with simple hairs only; corolla 11–17 mm long; northern ..... **162. G. potamica**
Perennial herb or subshrub; leaves and stems with glandular hairs; corolla 20–25 mm long; southern 7

7. Leaves ovate to orbicular; corolla yellow; seeds verrucose (covered with small wart-like projections), wingless; southern Gulf ..... **46. G. grandiflora**
Leaves oblanceolate to obovate; corolla blue to mauve; seeds colliculate-punctate, wing *c.* 0.1 mm wide; Victoria River area ..... **27. G. scaevolina**

8. Calyx lobes markedly unequal, adaxial calyx lobe much longer than others; seeds reticulate, wing 0.2–0.4 mm wide ..... **136. G. redacta**
Calyx lobes all equal, adaxial calyx lobe equal to others; seeds smooth to verrucose or aculeate, wing usually absent 9

9. Flowers sessile; corolla to 5 mm long; seeds verrucose, granulose ... **164. G. subauriculata**
Flowers pedicellate; corolla more than 5 mm long; seeds various 10

10. Indusium folded longitudinally, with furrow on upper surface; corolla 5–7 mm long; seeds aculeate (covered in prickles), reticulate, wing 0.1–0.2 mm wide ..... **137. G. odonnellii**
Indusium concave, not folded (rarely grooved); corolla 7 mm or more long 11

11. Calyx lobes 7–12 mm long and 1.5–2 wide 12
Calyx lobes less than 7 mm long or less than 1 mm wide or both (rarely more than 7 mm long but then 1 mm wide or less) 13

12. Seeds verrucose to aculeate ..... **154. G. sepalosa**
Seeds smooth ..... **158. G. durackiana**

13. Seeds smooth to minutely colliculate-alveolate or reticulate 14
Seeds verrucose, granulose 18

14. Seeds biconvex, lacking a rim or wing, basal elaiosome present; corolla purple-brown; calyx lobes less than 2 mm long ..... **G. elaiosoma**
Seeds flattened or concavo-convex, rimmed or winged, lacking an elaiosome; corolla more or less yellow; calyx lobes usually more than 2 mm long 15

15. Cauline leaves entire, petiolate, base long attenuate; seeds reticulate, prominently winged ..... **108. G. strangfordii**
Cauline leaves and bracts usually dentate, sessile or with a short petiole, base rounded to cordate; seeds smooth or minutely colliculate-alveolate, rimmed but almost wingless 16

16. Inner surface of corolla densely pubescent; calyx lobes 5–11 mm long; corolla 15–23 mm long; abaxial corolla lobes 5–8 mm long; capsule 5–8 mm diam. **157. G. leiosperma**
Inner surface of corolla with few hairs; calyx lobes 2–5 mm long; corolla less than 14 mm long; abaxial corolla lobes 2–5 mm long; capsule less than 5 mm diam. 17

17. Stems glabrous, ovary glabrous or with a few strigose hairs ..... **167. G. argillacea**
Stems with scattered hairs, ovary densely hairy .. **G. sp. Melville Island (N.B.Byrnes 666)**

18. Cauline leaves and bracts shortly petiolate, auricles absent or inconspicuous; calyx lobes 1.2–2 mm wide ..... **156. G. brachypoda**
Cauline upper leaves and bracts sessile and often conspicuously auriculate; calyx lobes 1 mm or less wide 19

19. Corolla 7–14 mm long; stems glabrous or with a few coarse hairs 20
    Corolla 15–25 mm long; stems sparsely hirsute to hispid, rarely glabrous 21

20. Calyx lobes 1–2 mm long; corolla yellow, 7–8 mm long, abaxial corolla lobes shorter than their connate part ..... **160. G. campestris**
    Calyx lobes 2–4 mm long; corolla mauve, sometimes more or less yellow towards top, 9–14 mm long; abaxial corolla lobes at least as long as their connate part ..... **161. G. malvina**

21. Capsule ellipsoidal; calyx lobes 0.4–0.6(–0.8) mm wide, hispid; leaves (7–) 10–20 mm wide ..... **163. G. hispida**
    Capsule more or less globular; calyx lobes 0.8–1 mm wide, with a few marginal bristles; leaves 5–10 mm wide ..... **159. G. byrnesii**

Acknowledgements

I wish to thank Clyde Dunlop for valuable discussions in early stages of preparation of this paper. Raelee Kerrigan and Bob Harwood first brought the species to my attention and assisted with fieldwork. Sally Jacka kindly showed me the Finniss River population. The key to species is derived, in part, from an as yet unpublished key to 14 species found in the Darwin Region prepared by Clyde Dunlop, Greg Leach and myself. Annette Wilson offered guidance during my short visit to Kew, whilst Laurie Jessup and Alex Chapman during their respective terms as ABLO searched at Kew for the type of *G. armstrongiana* and literature on my behalf. Dale Dixon and Raelee Kerrigan read and commented on the manuscript. Monica Osterkamp Madsen prepared the illustration.

References

Carolin, R.C. (1990). Nomenclatural notes and new taxa in the genus *Goodenia* (Goodeniaceae). *Telopea* 3: 517–570.

Carolin, R.C. (1992). *Goodenia. Flora of Australia* 35: 147–281. CSIRO Publishing: Melbourne.

Doyle, N. (2001). *Extractive minerals within the outer Darwin area.* Report 14. Northern Territory Geological Survey: Darwin.

Holland, A.E. & Boyle, T.P. (2002). Four new species of *Goodenia* Smith (Goodeniaceae) from Queensland. *Austrobaileya* 6: 253–266.

Iucn (2001). *IUCN Red List Categories and Criteria: Version 3.1.* IUCN Species Survival Commission. IUCN: Gland and Cambridge.

Leach, G.J. (2000). Notes and new species of *Eriocaulon* (Eriocaulaceae) from Australia. *Australian Systematic Botany* 13: 755–772.

Taylor, P. (1989). *The Genus* Utricularia - *A taxonomic monograph.* Her Majesty's Stationary Office: London.

Williams, M.A.J. (1969). Geomorphology of the Adelaide-Alligator area. In R. Story, M.A.J. Williams, A.D.L. Hooper, R.E. O'Ferrall & J.R. McAlpine (eds.), *Lands of the Adelaide-Alligator Area, Northern Territory*, pp. 71-94. Land Research Series No. 25. CSIRO: Melbourne.

Woinarski, J.C.Z., Hempel, C., Cowie, I., Brennan, K., Kerrigan, R., Leach, G. & Russell-Smith, J. (in prep.) Distributional patterning of restricted range plant species in the Northern Territory, Australia.

Studies in Euphorbiaceae *s.lat.* 7

Shonia R.J.F.Hend. & Halford (*Ricinocarpeae, Ricinocarpinae*), a new Australian endemic genus

David A. Halford & Rodney J.F. Henderson

Summary

Halford, D.A. & Henderson, R.J.F. (2005). Studies in Euphorbiaceae *s.lat.* 7. *Shonia* R.J.F.Hend. & Halford (*Ricinocarpeae, Ricinocarpinae*), a new Australian endemic genus. *Austrobaileya* 7(1): 215–228. The new, Australian endemic genus *Shonia* R.J.F.Hend. & Halford. is described and compared with *Beyeria* Miq. and *Ricinocarpos* Desf., to which it is closely allied, and *Bertya* Planch. Four species are recognised and a key is provided for their identification. Two species, *Shonia carinata* Halford & R.J.F.Hend. and *S. territorialis* Halford & R.J.F.Hend., are described as new, and the new combinations *S. tristigma* (F.Muell.) Halford & R.J.F.Hend. and *S. bickertonensis* (Specht) Halford & R.J.F.Hend., based on *Beyeria tristigma* F.Muell. and *Beyeria bickertonensis* Specht respectively, are made for the other two. Two new subspecies are recognised in *S. tristigma*, namely S. *tristigma* subsp. *parvifolia* Halford & R.J.F.Hend. and *S. tristigma* subsp. *borealis* Halford & R.J.F.Hend. All species are described, maps provided for their distribution, and information on their phenology and the habitat of their occurrence is given. The new species are illustrated and a lectotype is chosen for *Beyeria tristigma* F.Muell.

Key Words: Euphorbiaceae, *Ricinocarpeae*, *Ricinocarpinae, Shonia*, *Shonia bickertonensis, Shonia carinata, Shonia territoralis, Shonia tristigma, Shonia tristigma* subsp. *borealis, Shonia tristigma* subsp. *parvifolia, Beyeria* sect. *Oxygyne,* Australian flora, taxonomy

D.A. Halford & R.J.F. Henderson, c/- Queensland Herbarium, Environmental Protection Agency, Brisbane Botanic Gardens, Mt Coot-tha Road, Toowong, Queensland 4066, Australia

Introduction

Following a review of the attributes of taxa included in the Australian endemic genus *Beyeria* Miq., it became clear that the taxon Ferdinand Mueller called *B. tristigma* in 1868, and included as the only species in his *Beyeria* sect. *Oxygyne*, differs significantly in attributes of its inflorescence and female flowers from those characteristic of *B. viscosa* Miq., which includes the type of the genus name *Beyeria* Miq. *Beyeria tristigma* agrees more with *Ricinocarpos* Desf. in respect to its female floral attributes than to *Beyeria* while still retaining attributes in common with the latter genus. Segregation of this taxon as a distinct genus seems warranted because of these fundamental differences, and the existence of other taxa possessing floral attributes similar to those of *B. tristigma.* This idea of segregation is not entirely new. Bentham (1873: 68) was clearly perplexed as to where to place *B. tristigma* for he noted "the racemose male flowers, the petals much longer than the calyx, and the divided stigma or style bring this species near to *Ricinocarpos*, but the stamens are entirely those of *Beyeria*, and the stigmatic lobes are closely recurved as in that genus, to which on the whole it appears to be the nearest related". However; Bentham, like Mueller (1868) before him, considered that it was sufficiently distinct from the other *Beyeria* species then recognised to accord it sole membership of a distinct section of this genus that Mueller had named *Beyeria* sect. *Oxygyne*. Bentham characterised this section as having "Anthers of *Beyeriopsis*", which he had previously accepted (*op. cit.*: 63, 66) as *Beyeria* sect. *Beyeriopsis*, the "stigma deeply divided into 3 narrow lobes", which he later described as flat and recurved, and "male flowers in a loose raceme".

In his account of *Beyeria*, Grüning (1913) recognised the uniqueness of *B. tristigma* and accepted it as a "transition form" from *Ricinocarpos* to *Beyeria* but persisted in including it in *Beyeria.*

Accepted for publication 16 August 2005

From their overall morphology as well as their porate pollen grains with a "crotonoid" pattern of polygonally arranged sexinous processes, *Beyeria tristigma* and its allies are clearly related to *Beyeria* and to *Ricinocarpos* and thus belong with them in Mueller Argoviensis's tribe *Ricinocarpeae*, and within that to subtribe *Ricinocarpinae* Webster (Webster 1994). We have come to the conclusion that these species would be as out of place in *Ricinocarpos*, as they are in *Beyeria*, and that they appear to occupy a morphological position between those two genera. We have, therefore, established the genus *Shonia* to accommodate them. The structure of their inflorescences and flowers provide the main characters to distinguish them from *Beyeria* and *Ricinocarpos*.

Shonia differs from *Beyeria* by the following combination of characters: inflorescences racemose with usually one or two female flowers basal on the axis with few to several male flowers distal to them, the female flowers with styles with three horizontally spreading and entire stigmatic lobes sometimes becoming decurved or recurved with age. *Shonia* differs from *Ricinocarpos* by the following combination of characters: male flowers with anthers terminal and transverse on the filaments, an androecium on a flat or slightly convex receptacle, and female flowers with entire stigmatic lobes.

Recent molecular studies of the uniovulate Euphorbiaceae (Wurdack *et al.* 2005) suggest a close relationship between *Beyeria*, *Ricinocarpos* and *Bertya* Planch. (tribe *Ricinocarpeae*, subtribe *Bertyinae* Müll.Arg.), another endemic Australian Euphorbiaceae genus. For a complete revision of *Bertya* see Halford and Henderson (2002). A comparison of important diagnostic differences between *Bertya*, *Beyeria*, *Ricinocarpos* and *Shonia* is provided in **Table 1**.

Key to Australian genera of Euphorbiaceae tribe *Ricinocarpeae* based on female flowers

1. Stigma entire, dilated and forming a cap over the top of the ovary, discoid or rarely with 2 appressed entire limbs or shallowly 3-lobulate ..... **Beyeria**
Stigma with 3 horizontally spreading and divergent limbs sometimes becoming decurved or recurved with age; limbs entire or 2- to 5-lobed 2

2. Stigmatic limbs entire ..... **Shonia**
Stigmatic limbs divided 3

3. Disc present ..... **Ricinocarpos**
Disc absent ..... **Bertya**

Key to Australian genera of Euphorbiaceae tribe *Ricinocarpeae* based on male flowers

1. Flowers with staminal filaments erect to spreading from a central cylindrical column formed by fusion of the bases of filaments 2
Flowers with staminal filaments erect to spreading on a flat or slightly convex to hemispherical receptacle, with filaments free 3

2. Petals conspicuous, or if absent then calyx spreading at anthesis ..... **Ricinocarpos**
Petals absent or rudimentary, calyx strongly recurved at anthesis ..... **Bertya**

3. Flowers in racemes ..... **Shonia**
Flowers in few flowered fascicles or cymose clusters, or solitary ..... **Beyeria**

Table 1. Morphological comparison of *Bertya*, *Beyeria*, *Ricinocarpos* and *Shonia*

Character	*Bertya*	*Beyeria*	*Ricinocarpos*	*Shonia*
arrangement of flowers	paired or in umbelliform clusters, or solitary	in fascicles or cymose clusters, or solitary	in umbelliform clusters, or racemes, or solitary	in racemes
male flowers:				
petals	absent or rudimentary	present or absent	present or absent	present
disc	absent	present or absent	present	present
stamens	spreading from central column formed by fusion of bases of filaments	erect on flat to hemispherical receptacle	erect to spreading from central column formed by fusion of bases of filaments	erect on flat or slightly convex receptacle
position of anthers in relation to filament	distal and longitudinal	terminal and transverse or distal and longitudinal	distal and longitudinal	terminal and transverse
female flowers:				
petals	absent or rudimentary	present or absent	present or rarely absent	present
disc	absent	present or absent	present	present
stigmatic limbs: degree of division	deeply 2- to several-lobed	elobate and calyptriform or discoid, or rarely bipartite or shallowly 3-lobulate	deeply 2(rarely 3 to 5)-lobed	entire
stigmatic limbs: orientation	spreading to ascending rarely recurved distally	appressed	spreading and divergent	spreading sometimes becoming decurved or recurved with age

Materials and methods

The present study involved examination of herbarium specimens by the authors together with field investigations by the second author from 1988 to 1992. Altogether, approximately 80 specimens have been examined and annotated, comprising collections from the following herbaria: BRI, CANB, DNA, K, MEL. Acronyms used in the text to indicate herbaria holding particular specimens follow Holmgren *et al.* (1990). All specimens cited have been seen unless indicated as *n.v.* (*non visus*).

Descriptions of taxa were made from dried herbarium specimens, material preserved in 70% ethanol and glycerol, or dried material reconstituted by placing in boiling water for a few minutes. Colour of fresh vegetative and floral parts are either from herbarium label notes or from photographs taken by the second author during field studies. Plant size, habit, flowering and fruiting times and habitat data were obtained from herbarium labels. The distribution maps were produced with MapInfo Version 3 and were based on herbarium specimen locality data.

Taxonomy

Shonia R.J.F.Hend. & Halford, gen. nov. affinis *Beyeriae* Miq. et *Ricinocarpi* Desf. Ab illa floribus in racemis apicalibus vel apparenter axillaribus dispositis floribus plerumque ambobus maribus femineisque in quoque racemo (non floribus solitariis vel fascicularibus vel cymosis in foliorum axillis), petalis bene evolutis plerumque quam sepala multo longioribus raro aequantibus (non petalis carentibus vel petalis sepala brevioribus), stylorum ramis stigmaticis 3 e columna brevi orientibus, linearibus integris dorsi-ventraliter complanatis (non stylis peltatis et inverse cupulatis vel inverse patelliformibus marginibus integris vel laceratis) differt. Ab hoc stylorum ramis stigmaticis integris dorsi-ventraliter complanatis (non distaliter bifidis vel raro ad 5-lobatis lobis teretibus vel dorsi-ventraliter complanatis sed abaxialiter sulcatis), staminalibus filamentis e basi liberis (non proximaliter diverse connatis) differt. **Typus:** *Shonia tristigma* (F.Muell.) Halford & R.J.F.Hend. (= *Beyeria tristigma* F.Muell.)

Beyeria sect. *Oxygyne* F.Muell., *Fragm.* 6: 1812 (1868), *nom. inval.*, F.Muell. ex Benth., *Fl. Australiensis* 6: 68 (1873). **Type:** *Beyeria tristigma* F.Muell. (= *Shonia tristigma* (F.Muell.) Halford & R.J.F.Hend.).

Monoecious or rarely dioecious shrubs or rarely small trees; stems erect or ascending, branching, the branches leafy throughout. Leaves spirally alternate, exstipulate, shortly petiolate, persistent, with laminae glabrous and smooth adaxially, stellate pubescent abaxially except for the glabrous surface of the raised midvein; secondary veins obscure; basi-laminar glands absent. Inflorescences racemose or rarely paniculate, terminal on stems or on axillary branches sometimes reduced so inflorescences appear axillary, with one or two female flowers basal on the axis and with few to several male flowers distal to them, or rarely with all flowers male, bracteate. Flowers pedicellate with pedicels stouter in female flowers than those of male flowers; calyx deeply 5- or rarely 4-lobed, with margins of lobes entire; petals present; disc present. Male flowers with a disc of discrete alternipetalous glands or a continuous glandular ring; stamens 10–30, free and erect on a flat or slightly convex receptacle; anthers dorsifixed, extrorse, of two separate obloid, parallel but contiguous locules each transverse on a slightly swollen connective at the apex of filament, dehiscing by longitudinal slits; pistillodes absent. Female flowers with calyx lobes persistent and appressed to ovary, with a disc of a continuous glandular ring; ovary 3-locular with one pendant ovule in each locule; style short or ± obsolete; stigma with 3 horizontally spreading and divergent limbs, sometimes becoming decurved or recurved with age; limbs entire, ± dorsi-ventrally flattened, red, glabrous, persistent. Fruits capsular, trilobate, smooth, glabrous, separating septicidally into three 2-valved cocci leaving a persistent columella. Seeds obloid, smooth, carunculate; caruncle waxy-fleshy; endosperm copious; cotyledons narrower than the radicle.

The genus is endemic in Australia and contains four species distributed in tropical north eastern Northern Territory and central and north eastern Queensland.

***Etymology*:** We have named this genus *Shonia* in memory of the second author's late wife, Enid Lynette 'Shoni' Henderson, accidentally killed when their car crashed on a holiday/fieldtrip in the Northern Territory in 1991 looking for 'Stenolobeae' taxa. The second author wishes to acknowledge with gratitude her support for him and his botanical work over more than 30 years. The name should be pronounced "SHOWN-ee-a".

Key to species of *Shonia*

1. Calyx lobes prominently keeled abaxially . . . . . **4. S. carinata**
   Calyx lobes evenly rounded abaxially, not prominently keeled 2

2. Leaf laminae narrow-elliptic or narrow-oblanceolate to narrow-obovate, with a length/width ratio less than 6:1 . . . . . **1. S. tristigma**
   Leaf laminae narrow-lanceolate or linear, with a length/width ratio of 6:1 or greater 3

3. Leaf laminae 3–10 mm wide, with a length/width ratio of 15:1 or less . . . . . **2. S. territorialis**
Leaf laminae less than 3 mm wide, with a length/width ratio greater than 15:1 . . . . . **3. S. bickertonensis**

***Note*:** A specimen apparently of this genus collected from Blackdown, WNW of Chillagoe in north Queensland, in 1997 (*Ford 1883* (BRI)) is from a shrub to 3 m tall which has leaves with laminae linear and less than 2 mm wide. Also, these leaves are obtuse and ultimately rounded at the apex. As the material is incomplete, lacking mature flowers and fruit, it is not possible to place it in any of the above species unequivocally. Further investigation may find it to represent yet another species of *Shonia* or perhaps another subspecies of *S. tristigma*.

1. Shonia tristigma (F.Muell.) Halford & R.J.F.Hend., **comb. nov.**; *Beyeria tristigma* F.Muell., *Fragm.* 6:181 (1868). **Type:** Queensland. North Kennedy District: Hinchinbrook Island, 8 November 1867, [*J. Dallachy s.n.*] (lecto [here chosen]: MEL 114230; isolecto: K).

Monoecious, erect to spreading shrubs or rarely small trees to 4 m high, thinly viscid on most parts; bark shallowly fissured, reddish brown. Branchlets somewhat angular, becoming ± terete with age, glabrous. Leaves with petioles 1–2 mm long, flattened adaxially, rounded abaxially, glabrous and smooth; laminae narrow-elliptic, narrow-oblanceolate to narrow-obovate, 10–60 mm long, 2–15 mm wide, with a length/width ratio of 2–8:1, cuneate to attenuate at the base, rounded to obtuse or acute at the apex and recurved along the margins; adaxial surface green, with midvein impressed; abaxial surface white, with stellate hairs soft and up to *c.* 0.2 mm across, and with the raised midvein rounded in cross section. Inflorescences racemose, usually of one or two female flowers basal on the axis with 5–12 male flowers distal to them; primary axis 13–40 mm long, glabrous, smooth; bracts triangular, *c.* 0.5 mm long, glabrous, caducous. Flowers with calyx 5-lobed, of unknown colour when fresh, glabrous; tube *c.* 0.1 mm long; lobes ± spreading; petals 5, of unknown colour when fresh, glabrous except for a tuft of hairs near the base on the adaxial surface. Male flowers with pedicels 5–25 mm long, angular, glabrous; calyx lobes oblong, 0.8–1 mm long, 0.6–0.7 mm wide, obtuse to rounded at the apex; petals broadly ovate or suborbicular, 1.4–1.6 mm long, 1.3–1.5 mm wide, rounded to obtuse at the apex, recurved to revolute distally; disc a ± continuous glandular ring, fleshy, lobed, glabrous; receptacle convex, 0.8–1 mm across, minutely hairy; stamens 20–25; filaments 0.3–0.5 mm long, ± glabrous; anthers 0.3–0.4 mm long. Female flowers with pedicels 10–30 mm long, slender and circular in transverse section proximally, becoming stouter and 5-quetrous distally, glabrous or densely pubescent distally; calyx lobes oblong, 1–1.2 mm long, 0.7–0.8 mm wide, obtuse to rounded at the apex; petals suborbicular, *c.* 1.2 mm long and 1.2 mm wide, rounded at the apex, recurved distally; disc membranous, entire; ovary subglobose, trilobate, 1.3–1.5 mm across, ± smooth, glabrous; style *c.* 0.2 mm long; stigmatic limbs 1–2 mm long. Fruits broadly ellipsoid or subglobose, 5.5–7 mm long, 5–7 mm across. Seeds 4.2–5.5 mm long (including caruncle), 3–3.2 mm wide, 2.5–2.7 mm across; testa smooth, dark brown; caruncle ± hemispherical, *c.* 0.5 mm long and 1.2 mm across, ± smooth, creamy-white.

***Distribution and habitat*:** *Shonia tristigma* is confined to the east coast of north-eastern Queensland where it occurs in disjunct populations from Cape York southwards to Hinchinbrook Island, a little north of Ingham.

***Typification*:** One collection is cited in the protologue of *Beyeria tristigma*, namely "In insula Hinchinbrook-Island prope Rockingham's Bay, Dallachy". Two apparently relevant sheets from this locality have been located in material on loan to BRI from MEL and K. The sheet in MEL [114230] is without information on the collector but is dated as collected on 8 November 1867, while the sheet in K has information on the collector but is without the date of collection. We considered both to be part of the original material and hence the MEL sheet is here selected as lectotype of Mueller's name.

***Notes*:** As circumscribed here, *S. tristigma* exhibits some variation in leaf shape and size as well as habitat differences. This variation is here formally recognised by the establishment of three subspecies within this species.

Key to the subspecies of *Shonia tristigma*

1. Leaf laminae narrow-elliptic, 30–60 mm long, 10–15 mm wide . . . . . **1a. S. tristigma** subsp. **tristigma**
Leaf laminae narrow-oblanceolate to narrow-obovate, 10–40 mm long, 2–10 mm wide **2**

2. Shrubs to 0.5 m high; leaf laminae less than 20 mm long, 2–5 mm wide . . . . . **1c. S. tristigma** subsp. **parvifolia**
Shrubs (0.2–) 0.5–4 m high; leaf laminae 20 mm or more long, mostly more than 5 mm wide . . . . . **1b. S. tristigma** subsp. **borealis**

1a. Shonia tristigma (F.Muell.) Halford & R.J.F.Hend. subsp. **tristigma**

Slender shrubs to 2.5 m high. Leaf laminae narrow-elliptic, 30–60 mm long, 10–15 mm wide.

***Additional specimens examined*: Queensland.** North Kennedy District: Zoe Bay, Hinchinbrook Island, Aug 1951, *Blake 18859* (BRI); Mt Bowen, Hinchinbrook Island, Jun 1991, *Cumming 11222* (BRI); Mt Diamantina, Hinchinbrook Island, Jul 1991, *Cumming 11279* (BRI); Little Ramsay Bay, Hinchinbrook Island, Aug 1975, *Sharpe 1593* (BRI); *loc. cit.*, Aug 1975, *Sharpe 1666* (BRI); northern end of Little Ramsay Bay, Aug 1975, *Sharpe 1682* (BRI); Zoe Bay, Hinchinbrook Island, Oct 1982, *Tracey 15491* (BRI, CANB).

***Distribution and habitat*:** *Shonia tristigma* subsp. *tristigma* is endemic to Hinchinbrook Island. It is recorded as growing on steep south or south-east facing rocky slopes in heathland or *Banksia plagiocarpa* and *Allocasuarina littoralis* closed shrubland communities, on steep north facing rocky slopes in rainforest and on plains of alluvial soils in *Corymbia tessellaris* woodland. **Map 1.**

***Phenology*:** Flowers have been collected in July, August and October, fruits in July and August.

1b. Shonia tristigma subsp. **borealis** Halford & R.J.F.Hend., **subsp. nov.** folii lamina angusta-oblanceolata usque angusta-obovata, 20–40 mm longa et (3–) 5–10 mm lata ab subspeciebus aliis *S. tristigmatis* differt. **Typus:** Queensland. Cook District: Tozers Gap, 30 June 1994, *P.I. Forster PIF15396* (holo: BRI; iso: K, MEL, NSW, QRS *distribuendi*).

Erect to spreading shrubs (0.2–) 0.5–4 m high or rarely a small tree. Leaf laminae narrow-oblanceolate to narrow-obovate, 20–40 mm long and (3–) 5–10 mm wide. **Fig. 1.**

***Selected specimens* (*from 36 examined*): Queensland.** Cook District: slopes of Mt Fraser, Apr 1932, *Brass 2430* (BRI); Newcastle Bay, 2.5 miles [*c.* 4 km] S of Somerset, May 1948, *Brass 18772* (BRI, CANB, K); Brown's Creek, Pascoe River, Jun 1948, *Brass 19170* (BRI, CANB, K); Tozer Range, Jun 1948, *Brass 19351* (BRI, CANB, K); beach dune S of Cape Bedford, Jul 1980, *Clarkson 3292* (BRI, CANB); between McIvor River and Cape Flattery, Nov 1972, *Dockrill 616* (BRI); *c.* 1 km upstream from Brown Creek crossing, Iron Range road, Apr 1988, *Forster PIF4161 & Liddle* (BRI); 16 km E of Maloneys Springs, Bromley station, Jul 1991, *Forster PIF8842* (BRI); Mt Tozer, Iron Range N.P., Jul 1994, *Forster PIF15431* (BRI); Silver Plains, 4 km WNW of Colmer Point, Jun 1999, *Forster PIF24645 & Booth* (BRI); Tozers Gap, Aug 1965, *Gittins 1082* (BRI); Olive River, Sep 1974, *Hyland 7444* (BRI, CANB); near Cape Bedford, Jun 1968, *Pedley 2617* (BRI); near McIvor River, Sep 1960, *Smith 11144* (BRI); Iron Range, along road between Browns Creek and Tozers Gap, Jul 1988, *Thomas 290* (BRI); Olive River, Sep 1974, *Webb & Tracey 13801* (BRI); between Starcke station homestead and Cape Flattery, Jul 1976, *Webb & Tracey 13833* (BRI).

***Distribution and habitat*:** *Shonia tristigma* subsp. *borealis* occurs in coastal and subcoastal populations from Cape York southwards to Mt Fraser near Mossman. It is recorded as growing on coastal or near-coastal sand dunes, in sandy soils on rocky slopes and rocky headlands, in heathland, shrubland, woodland and open forest with heath understorey, and in vine thicket communities. **Map 2.**

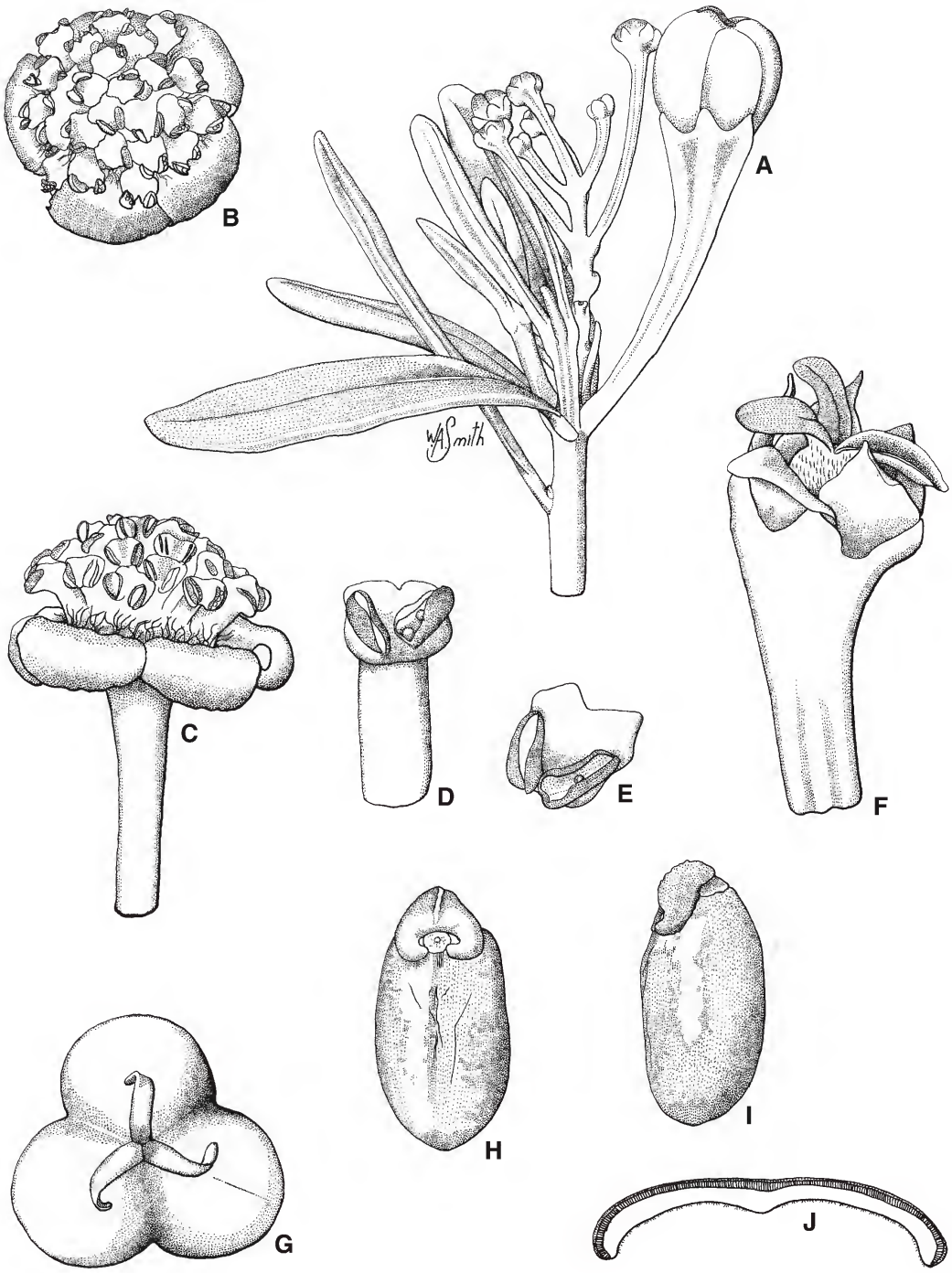


Fig. 1. ***Shonia tristigma*** subsp. ***borealis***. A. Flowering branchlet. ×3. B. face view of male flower. ×12. C. side view of female flower. ×12. D. lateral view of stamen. × 40. E. face view of anther. ×40. F. side view of female flower. ×12. G. face view of fruit. ×6. H. ventral view of seed. ×6. I. lateral view of seed. ×6. J. transverse section of leaf. ×12. A-J from *Forster PIF15396* (BRI). Del. W.Smith.

***Phenology*:** Flowers have been collected from February to October, fruits from May to September.

***Notes*:** *Shonia tristigma* subsp. *borealis* is variable in its stature which to some degree appears to be related to habitat. Plants on exposed coastal sites or in heathland communities tend to be low shrubs 0.2–1 m high whereas plants in more sheltered sites such as woodland or forest communities tend to be larger shrubs or small trees 1–4 m high.

The collection *Brass 2430* from the slopes of Mt Fraser (BRI) differs from all other collections of this subspecies by having an indumentum of stellate hairs on the branchlets as compared with glabrous branchlets in other collections seen. This collection is also markedly disjunct from the other collections cited for this subspecies.

***Etymology*:** The subspecific epithet is from Latin *borealis*, north or northern, and refers to the northerly distribution of this subspecies compared with the remainder of this species.

1c. Shonia tristigma subsp. **parvifolia** Halford & R.J.F.Hend., **subsp. nov.** folii lamina angusta-oblanceolata, 2–5 mm lata et 10–17 mm longa ab subspeciebus aliis *S. tristigmatis* differt. **Typus:** Queensland. Cook District: 7 km W of Jowalbinna, 5 July 1990, *A.R. Bean 1717* (holo: BRI).

Erect shrubs to 0.5 m high. Leaf laminae narrow-oblanceolate, 10–17 mm long, 2–5 mm wide.

***Additional specimens examined*: Queensland.** Cook District: 6 km S of Jowalbinna turnoff on Maytown track, Nov 1983, *Clarkson 5053* (BRI, CANB); Sandy Creek, 6 km NE of Jowalbinna and 25 km SSE of Laura, Jul 1998, *Wannan 908 et al.* (BRI).

***Distribution and habitat*:** *Shonia tristigma* subsp. *parvifolia* is known only from near Jowalbinna which is approximately 30 km SSW of Laura, on Cape York Peninsula. This taxon is recorded as growing in a small ravine in *Eucalyptus*/*Corymbia* woodland around large sandstone boulders, on sandy soil in *Corymbia*/*Eucalyptus* woodland and on skeletal soils on sandstone slopes with *Eucalyptus phoenicea*. **Map 3.**

***Phenology*:** Flowers have been collected in July and November, fruits in July.

***Etymology*:** The subspecific epithet is derived from Latin *parvus*, small, and *-folius*, -leaved, and refers to the relatively small leaves of this subspecies compared with those in other subspecies of this species.

2. Shonia territorialis Halford & R.J.F.Hend. **sp. nov.** *S. tristigmati* et *S. bickertonensi* ut videtur artissime affinis. Ab *S. tristigmate* folii lamina (40–) 60–80 mm non 10–60 mm longa et angusta-lanceolata vel lineari non angusta-elliptica vel angusta-oblanceolata ad angusta-ovata, floris maris pedicello 2–10 mm non 5–25 mm longo et flore femineo stylo 0.2–0.6 mm non circa 0.2 mm longo et limbis stigmaticis 1.3–2.5 mm non 1–2 mm longis differt. Ab *S. bickertonensi* folii lamina 3–10 mm non 0.7–2.5 mm lata et ratione longitudinis latitudinibus 15:1 vel minus non ultra 15:1 et inflorescentiis axe primario 20–60 mm non 10–30 mm longo differt. **Typus:** Northern Territory. Magela Creek upper catchment, 10 April 1995, *I.D. Cowie 5737 & K. Brennan* (holo: DNA).

Monoecious or rarely dioecious shrubs to 1 m high, thinly viscid on most parts; bark shallowly fissured, grey. Branchlets somewhat angular becoming ± terete with age, glabrous. Leaves with petioles 1–3.5 mm long, flattened or slightly grooved adaxially, rounded abaxially, glabrous and smooth; laminae narrow-lanceolate or linear, (40–) 60–80 mm long, (3–) 5–10 mm wide, with a length/width ratio of 8–15:1, cuneate to attenuate at the base, acute at the apex and recurved along the margins; adaxial surface green, with midvein impressed; abaxial surface white, with stellate hairs soft and up to 0.2 mm across, and with the raised midvein angular in cross section. Inflorescences racemose or rarely paniculate, usually of one or two female flowers basal on the axis with 7–10 male flowers distal to them or rarely of all male flowers; primary axis 20–60 mm long, glabrous, smooth; bracts triangular, *c.* 0.5 mm long, glabrous, caducous. Flowers with calyx 5-lobed, of unknown colour when fresh, glabrous; tube *c.* 0.1 mm long; lobes ± spreading; petals 5, of unknown colour when fresh, ± glabrous. Male flowers with pedicels

2–10 (–15) mm long, ± terete, glabrous; calyx lobes triangular, 0.8–1.5 mm long, 0.6–0.7 mm wide, acute at the apex; petals broadly elliptic or suborbicular, 1.8–2 mm long, 1.4–1.6 mm wide, rounded to obtuse at the apex; disc a ± continuous glandular ring, fleshy, lobed, glabrous; receptacle slightly convex, *c.* 0.8 mm across, tomentose; stamens *c.* 20; filaments 0.3–0.5 mm long, ± glabrous; anthers 0.3–0.4 mm long. Female flowers with pedicels 25–50 mm long, slender proximally becoming stouter distally, ± terete, glabrous; calyx lobes triangular, 0.8–1.5 mm long, 0.5–0.8 mm wide, acute at the apex; petals broadly elliptic or suborbicular, *c.* 1.2 mm long and 1 mm wide, rounded at the apex, recurved distally; disc a ± continuous glandular ring, fleshy, lobed, glabrous; ovary subglobose, trilobate, 1–1.5 mm across, ± smooth, glabrous; style 0.2–0.6 mm long; stigmatic limbs 1.3–2.5 mm long. Fruits broadly ellipsoid, 6–7 mm long, 5–6 mm across. Seeds *c.* 6.5 mm long (including caruncle), 3.5 mm wide and *c.* 3 mm across; testa dark brown; caruncle ± hemispherical, *c.* 0.8 mm long and 1.7 mm across, smooth, creamy-white. **Fig. 2.**

***Additional specimens examined*: Northern Territory**. South Magela Gorge, 8 km SE of Mt Brockman, Jan 1991, *Brennan Bre892* (DNA); 12 miles [*c.* 19 km] S of Mt Brockman, Jul 1972, *Byrnes 2712* (BRI, CANB, NSW); 27 km SE of Jabiru, Feb 1973, *Craven 2418* (BRI, CANB, DNA); *c.* 10 miles (16 km) ESE of Noranda Mining Camp, Jun 1972, *Schodde AE40* (CANB, DNA).

***Distribution and habitat*:** *Shonia territorialis* is confined to Mt Brockman and the nearby Arnhem Land Plateau, Northern Territory. It is recorded as growing in monsoon forest communities in sandy soils in gullies or gorges. **Map 4.**

***Phenology*:** Flowers have been collected in January, February, April, June and July, fruits in January.

***Affinities*:** *Shonia territorialis* seems most closely related to *S. tristigma* and *S. bickertonensis*. It can be distinguished from *S. tristigma* by having generally longer leaf laminae (which are (40–) 60–80 mm long compared with 10–60 mm long in *S. tristigma*) that are narrow-lanceolate or linear rather than narrow-elliptic or narrow-oblanceolate to narrow-obovate, male flowers with generally shorter pedicels (which are 2–10 mm long compared with 5–25 mm long in *S. tristigma*) and female flowers with longer styles (which are 0.2–0.6 mm long compared with up to 0.2 mm long in *S. tristigma*). *Shonia territorialis* differs from *S. bickertonensis* by having leaf laminas wider (being 3–10 mm wide compared with 0.7–2.5 mm wide in *S. bickertonensis*) and proportionally shorter (having a length/width ratio equal to or less than 15:1 compared with more than 15:1 in *S. bickertonensis*) and generally longer inflorescences (with the primary axis being 20–60 mm long compared with 10–30 mm long in *S. bickertonensis*).

***Etymology*:** The specific epithet is from Latin *territorium*, territory, and *-alis*, belonging to, and refers to the distribution of this species being wholly within Australia's Northern Territory.

3. Shonia bickertonensis (Specht) Halford & R.J.F.Hend., **comb. nov.**; *Beyeria bickertonensis* Specht, *Rec. American-Australian Sci. Expedition Arnhem Land* 3: 249, fig. 8 (1958). **Type:** Northern Territory. South Bay, Bickerton Island, in gorge in sandstone hills, 21 June 1948, *R.L. Specht 641* (holo: BRI; iso: CANB, K, MEL).

Monoecious, multi-stemmed shrubs to 3 m high, thinly viscid on most parts; bark smooth or shallowly fissured, grey or brown. Branchlets somewhat angular becoming ± terete with age, glabrous. Leaves with petioles 1–2 mm long, flattened adaxially, rounded abaxially, glabrous; laminae linear, 30–50 (–70) mm long, 0.7–2.5 mm wide, with a length/width ratio of 18–55:1, cuneate at the base, ± acute at the apex and with margins recurved to the midrib; adaxial surface green, with midrib impressed; abaxial surface white, with stellate hairs soft and up to *c.* 0.2 mm across, and with the raised midvein angular in cross section. Inflorescences racemose, usually of one or two female flowers basal on the axis with 5–15 male flowers distal to them; primary axis 10–30 mm long, glabrous, smooth; bracts triangular, *c.* 0.5 mm long, glabrous, caducous. Flowers with calyx 5-lobed, of unknown colour when fresh, glabrous; tube *c.* 0.1 mm long; lobes ± spreading; petals 5, of unknown colour when fresh, glabrous. Male flowers with pedicels 1.5–10 mm long, terete,

Fig. 2. ***Shonia territorialis.*** A flowering branchlet. ×2. B. male flower viewed from above. ×12. C. male flower, oblique view. ×12. D. female flowers, lateral view. ×12. E. transverse section of leaf. ×16. A from *Craven 2418* (CANB); B & C from *Cowie 5737 & Brennan* (DNA); D & E from *Brennan Bre892* (DNA). Del. W.Smith.

glabrous; calyx lobes oblong, 1.5–1.8 mm long, 0.4–0.6 mm wide, rounded to obtuse at the apex; petals broadly ovate, 2.3–2.5 mm long, 1.2–1.4 mm wide, acute to obtuse at the apex; disc a ± continuous glandular ring, fleshy, lobed, glabrous; receptacle convex, *c.* 0.8 mm across, densely hairy; stamens 20–30; filaments 0.4–0.8 mm long, ± glabrous; anthers 0.3–0.4 mm long. Female flowers with pedicels 15–40 mm long, ± terete, slender proximally becoming stouter distally, glabrous; calyx lobes ovate, 0.5–1 mm long, 0.4–0.6 mm wide, acute at the apex; petals ovate or elliptic, 1.7–1.8 mm long, 1–1.2 mm wide, rounded at the apex; disc a ± continuous glandular ring, fleshy, lobed, glabrous; ovary subglobose, trilobate, *c.* 1.2 mm across, ± smooth, glabrous; style 0.1–0.5 mm long; stigmatic limbs 1.7–3 mm long. Fruits broadly ellipsoid, 5.5–7 mm long, 4.5–5 mm across. Seeds 4.8–5.2 mm long (including caruncle), 2.4–3 mm wide, 2–2.6 mm across; testa dark brown; caruncle ± hemispherical, 0.8–1 mm long, 1.2–2 mm across, ± smooth, creamy-white.

***Additional specimens examined*: Northern Territory.** 28 km NW of Oenpelli, Feb 1973, *Craven 2260* (CANB, DNA); Mount Permain, Arnhem Land, Oct 1987, *Dunlop 7034* (BRI, MEL); Bickerton Island, Apr 1993, *Dunlop 9323 & Leach* (BRI); Bickerton Island, North Bay, May 1993, *Egan 2368* (DNA); Umbakumba Road, Groote Eylandt, 6 May 1972, *Levitt s.n.* (CANB, DNA); Umbakumba Road, Groote Eylandt, 9 May 1972, *Levitt s.n.* (DNA); Douglas Springs, Eva Valley Station, Jun 1988, *Lucas 73* (BRI); Kakadu N.P., Douglas Springs, Jul 1991, *Menkhorst 1038* (DNA, MEL); Mt Borradaile, Arnhemland, Jul 1995, *Metcalfe s.n.* (DNA); Ruined City, 50 km NNE of Ngukurr, Nov 1987, *Russell-Smith 4194 & Lucas* (DNA); Upper East Alligator River, Arnhem Land, Apr 1988, *Russell-Smith 5229 & Lucas* (DNA); Eva Valley Station, 5 km E of Ranford Hill, Jun 1988, *Russell-Smith 5656 & Lucas* (DNA); 4.5 km SE of Mt Borradaile, Jun 1992, *Taylor 89* (DNA).

***Distribution and habitat*:** *Shonia bickertonensis* is confined to Arnhem Land and eastern off-shore islands of the Northern Territory. It is recorded as growing in sandy soils on sandstone hills and in gorges. **Map 5.**

***Phenology*:** Flowers have been collected in February, April to July and September to November, fruits in April, May, July and October.

4. Shonia carinata Halford & R.J.F.Hend. **sp. nov.** affinis *S. bickertonensi* Specht foliis linearis sed calycis lobis manifeste carinatis ab alter et speciebus omnibus aliis *Shoniae* differt. **Typus:** Queensland. Maranoa District: Summit of Junction Ridge, N of Marlong Arch, Mt Moffatt NP, 27 October 1998, *A.R. Bean 14305* (holo: BRI; iso: CANB, MEL, NSW *distribuendi*).

Beyeria sp. (Bull Creek Gorge B.O'Keeffe 573), in Forster & Halford (2002: 69).

Monoecious, erect to spreading multi-stemmed shrubs to 2 m high, viscid on most parts; bark rough and scaly, ± dark grey. Branchlets somewhat angular, becoming ± terete with age, glabrous. Leaves with petioles 0.5–1.2 mm long, ± terete, glabrous, smooth; laminae linear, 12–40 mm long, 0.8–1.4 mm wide, with a length/width ratio of 20–40:1, cuneate at the base, obtuse to rounded or acute at the apex and with the margins recurved to midrib; adaxial surface yellow-green, with midvein ± obscure; abaxial surface white, with stellate hairs soft and up to *c.* 0.1 mm across, and with the raised midrib angular in cross section. Inflorescences racemose, usually of one or two female flowers basal on the axis with 3–5 male flowers distal to them; primary axis 3–10 mm long, glabrous; bracts ovate, up to 0.4 mm long, glabrous, caducous. Flowers with calyx 5 (rarely 4)-lobed, green, glabrous; tube *c.* 0.1 mm long; lobes ± erect; petals 5 or rarely 4, of unknown colour when fresh, glabrous except for a tuft of hairs near the base on adaxial surface. Male flowers with pedicels 6–9 mm long, ± terete, glabrous; calyx lobes oblong, 0.8–1.1 mm long, 0.5–0.8 mm wide, obtuse to rounded at the apex, prominently keeled abaxially; petals broadly obovate, 1.4–1.6 mm long, 0.6–1.2 mm wide, rounded at the apex, recurved to revolute distally; disc of 5 discrete glands; glands dorsi-ventrally compressed, truncate to obtuse, glabrous; receptacle ± flat or slightly convex, 0.8–1 mm across, minutely hairy; stamens *c.* 10; filaments 0.7–0.8 mm long, glabrous; anthers 0.3–0.4 mm long. Female flowers with pedicels 12–17 mm long, slender and circular in transverse section proximally, becoming stouter and 5-quetrous distally, glabrous; calyx lobes

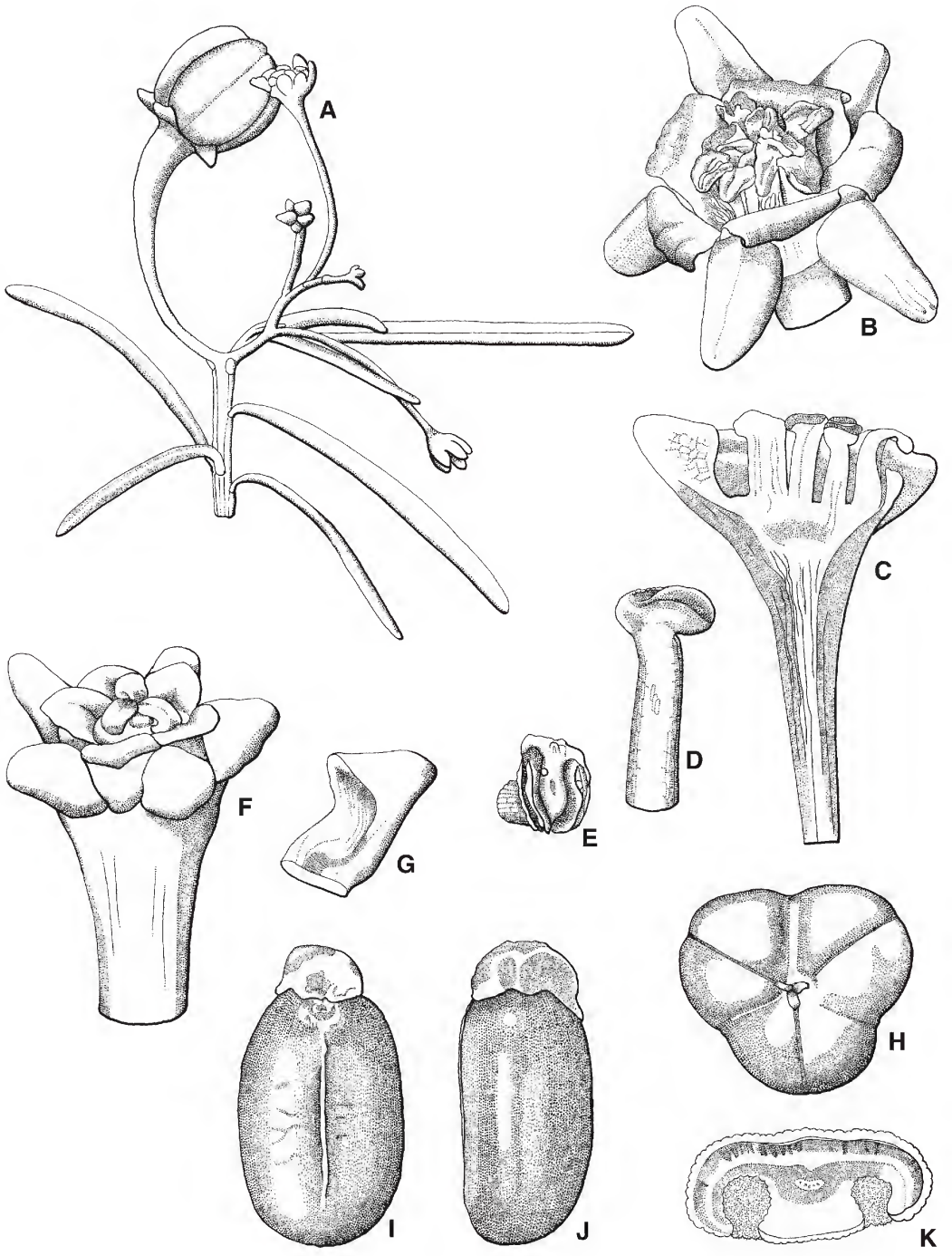


Fig. 3. ***Shonia carinata.*** A.flowering branchlet. ×3. B. side view of male flower. ×12. C. longitudinal section of male flower. ×15. D. lateral view of stamen. ×30. E. face view of anther. ×30. F. side view of female flower. ×12. G. calyx lobe. ×15. H. face view of fruit. ×6. I. ventral view of seed. ×9. J. lateral view of seed. ×9. K. transverse section of leaf. ×30. A-H & K from *Henderson & Turpin H3562 (BRI)*; I & J from *Bean 15369 & McDonald* (BRI). Del. W.Smith.

oblong, *c.* 1.2 mm long, 0.4–0.5 mm wide, obtuse to rounded at the apex, prominently keeled abaxially; petals suborbicular, *c.* 1.2 mm long and 1.2 mm wide, rounded at the apex, tumid abaxially, recurved distally; disc membranous, entire; ovary ellipsoid, trilobate, 1–1.3 mm across, smooth, glabrous; style *c.* 0.1 mm long; stigmatic limbs 0.3–0.4 mm long. Fruits broadly ellipsoid, 5–5.2 mm long, 5.2–5.4 mm across. Seeds *c.* 5 mm long (including caruncle), *c.* 2.5 mm wide and 2 mm across; testa dark brown; caruncle ± hemispherical, *c.* 1 mm long and 1.2 mm across, ± smooth, creamy-white. **Fig. 3.**

***Additional specimens examined*: Queensland.** Leichhardt District: Salvator Rosa N.P., S side of Cories Bluff, Sep 1990, *Ballingall 2682* (BRI); Bull Creek Gorge S of Springsure – Tambo Road, Sep 1999, *Bean 15365 & McDonald* (BRI); *loc. cit.,* Sep 1999, *Bean 15369 & McDonald* (BRI); Bull Creek Gorge, *c.* 60 km NE of Tambo, Aug 1991, *Henderson & Turpin H3558* (BRI); *loc. cit.,* Aug 1991, *Henderson & Turpin H3562* (BRI); Bull Creek Gorge area, Sep 1984, *O'Keeffe 573* (BRI); *loc. cit.,* Sep 1984, *O'Keeffe 660* (BRI); near Mt Salvator, Sep 1992, *O'Keeffe 991* (BRI); Salvator Rosa N.P., 170 km SW of Springsure, Sep 1987, *Thomas 255* (BRI). Maranoa District: Mt Mobil Holding, 15–20 km W of Umberilla homestead, Nov 1990, *Grimshaw CHR18* (BRI).

***Distribution and habitat*:** *Shonia carinata* is confined to central Queensland in an area more or less bounded by Tambo, Springsure and Mitchell. It is recorded as growing in shallow sandy soils associated with rocky sandstone slopes and cliff lines in woodlands dominated by *Eucalyptus cloeziana* F.Muell. and/or *E. decorticans* (F.M.Bailey) Maiden and with a shrubby understorey. **Map 6.**

***Phenology*:** Flowers have been collected from August to November, fruits in August and September.

***Affinities*:** *Shonia carinata* is similar to *S. bickertonensis* in having linear leaves but can be distinguished from that and all other species of *Shonia* by its abaxially prominently keeled calyx lobes.

***Etymology*:** The specific epithet is from the Latin *carinatus*, keeled, and refers to the prominent keeled calyx lobes in the flowers of this species.

Acknowledgments

We would like to thank Gordon Guymer for making space and facilities available at BRI for the first author; the directors and curators of CANB, DNA, K and MEL for the loan of their relevant holdings for study at BRI. The following persons provided assistance in this study and they are thanked sincerely for their efforts; Will Smith (BRI) for the excellent illustrations, Gerry Turpin (BRI) for assistance with fieldwork undertaken by the second author and Peter Bostock (BRI) for preparing the maps and allowing use of his Botanical Latin ('Translat') computer program to help construct the Latin description and diagnoses. Associated fieldwork between 1988 and 1992 by the second author and salary support in 1999 and 2000 for the first author were funded by grants from the Australian Biological Resources Study (ABRS) which are gratefully acknowledged.

References

Bentham, G. (1873). *Beyeria*. In *Flora Australiensis* 6: 63–68. L. Reeve & Co.: London.

Forster, P.I. & Halford, D.A. (2002). Euphorbiaceae. In R.J.F. Henderson (ed.), *Names and Distribution of Queensland Plants, Algae and Lichens,* pp. 68-74. Environmental Protection Agency: Brisbane.

Halford, D.A. & Henderson, R.J.F. (2002). Studies in Euphorbiaceae A.L.Juss. *sens. lat.* 3. A revision of *Bertya* Planch. (*Ricinocarpeae* Müll.Arg., *Bertyinae* Müll.Arg.). *Austrobaileya* 6(2): 187–245.

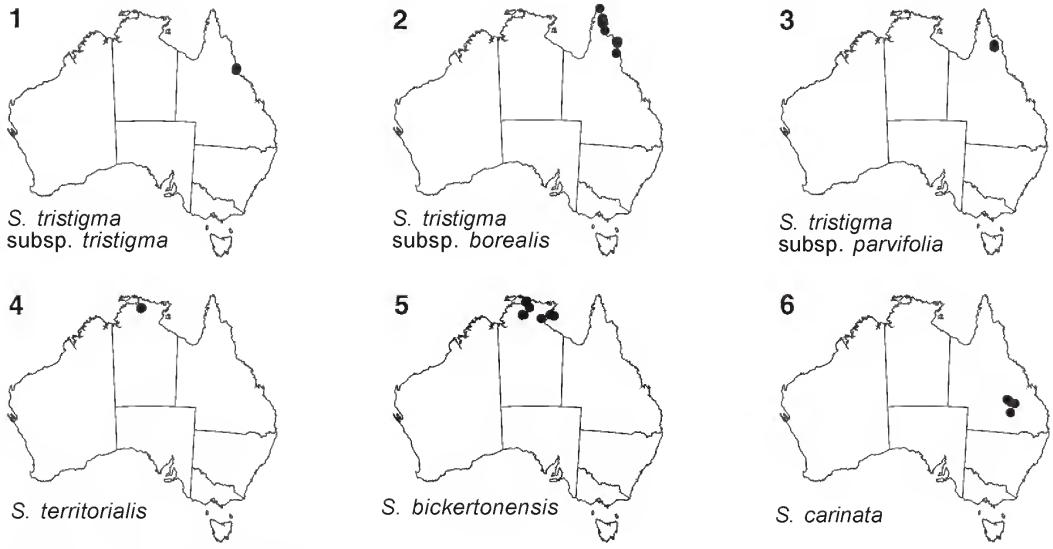
Holmgren, P.K., Holmgren, N.H. & Barnett, L.C. (1990). *Index Herbariorum. Part1. The Herbaria of the World,* 8th edn. New York Botanic Gardens: New York.

Grüning, G. (1913). IV. 147 Euphorbiaceae - *Porantheroideae* et *Ricinocarpoideae*. In A. Engler (ed.), *Das Pflanzenreich, Regni vegetabilis conspectus* H.58: 1–97. (1968 facsimile-H.R. Engelmann (J. Cramer): Weinheim/Bergstrasse).

Mueller, F. (1868). *Fragmenta Phytographiae Australiae* 6: 181/182. Victorian Government: Melbourne.

Webster, G.L. (1994). Synopsis of the genera and suprageneric taxa of Euphorbiaceae. *Annals of the Missouri Botanical Garden* 81: 33–144.

Wurdack, K.J., Hoffmann, P. & Chase, M.W. (2005). Molecular phylogenetic analysis of uniovulate Euphorbiaceae (Euphorbiaceae *sensu stricto*) using plastid RBCL and TRNL-F DNA sequences. *American Journal of Botany* 92: 1397–1420.



Maps 1-6. Distribution of *Shonia* taxa.

Short Communication

Cycas scratchleyana F.Muell. (Cycadaceae), a new species record for Queensland and Australia

Paul I. Forster

P.I. Forster, Queensland Herbarium, Environmental Protection Agency, Brisbane Botanic Gardens, Mt Coot-tha Road, Toowong, Queensland 4066. Email: paul.forster@epa.qld.gov.au

The genus *Cycas* has a wide distribution in Australia, the Western Pacific, Malesia, Asia and Madagascar. Thirty-eight species have been recently recognised as occurring in Australia (including its offshore islands and territories) and six species in adjacent Papuasia (Indonesia – Papua Province, Papua New Guinea, Solomon Islands) (Hill 1996, 1998, 2004; Hill *et al.* 2004; Claussen 2005). Queensland has 17 species and is a major centre of diversity for *Cycas* (Forster 2004).

In 2003, Bruce Wannan and Ing Toh collected material of a *Cycas* on Mer (Murray) Island in Torres Strait. Only a single plant was observed (B. Wannan, pers. comm. 2004). This collection is conspecific with *Cycas scratchleyana* F.Muell. known previously only from Papua New Guinea (Hill 1994; Hill *et al.* 2004); hence their collection is a new species record for both Queensland and Australia. Although the collection is from ± natural vegetation (Regional Ecosystem RE 3.2.5., but floristically closer to RE 3.2.13), the collectors note that it was made in sandy soil in a village.

Although Mer Island is politically part of Queensland, it is immediately adjacent to the mainland of Papua New Guinea and has at least one other plant species (*Alectryon repandodentatus* Radlk.) for which it is the only locality in Australia. One other species (*Apluda mutica* L.) is found only there and on two other islands in Torres Strait with regard to its Australian occurrence.

Mer Island is quite small in area and hosts a variably sized population of people with many links to the mainland of Papua New Guinea. While it is feasible that this cycad may have been transported from the mainland of Papua New Guinea at some time and perhaps planted at the locality it is unlikely to have happened in recent times due to the large size of the plant (*c.* 15-16 m tall). Alternatively the seed may have been transported as a food source in the past, as species of *Cycas* are utilised in this manner by indigenous people in Australia (Beck 1992) and Papua New Guinea (see Hill 1994 for a list of vernacular names for this species in Papua New Guinea). This cycad colony on Mer Island is geographically quite close to other recorded populations of *C. scratchleyana* in Papua New Guinea, hence it is also quite possible that the population is natural and its occurrence on the island is without anthropogenic influence.

Cycas scratchleyana F.Muell., *Vict. Nat.* 2(2): 18 (1885). **Type:** Papua New Guinea. Mt Bedford, Jala-River, Dedouri-Country, 1883, *W. Armit s.n.* (holo: MEL 68059; iso: K *n.v.*).

***Specimens examined* (all at BRI): Papua New Guinea.** CENTRAL PROVINCE: Kubuna, Nov 1938, *Brass 5643*; Kuriva Sawmill, Hiritano Highway road leading into company dry dock, 9° 10'S, 147° 00'E, *Larivita & Maru LAE70598;* Mekeo district, Jul/Aug 1918, *White 794.* GULF PROVINCE: Ihu, Vailalu River, Feb 1926, *Brass 994*; above Purari River, 63 km at 65° from Baimuru, 7° 15'S, 145° 20'E, Mar 1974, *Croft et al. LAE61174*; Mina River, upstream from limit of ship navigability, Mar 1974, *Womersley NGF46475.* MILNE BAY PROVINCE: track between Tutubea & Lake Lavu, Fergusson Island, 9° 33'S, 150° 45'E, Nov 1976, *Croft et al. LAE68785A*; *c.* 2 km inland of Medino, N Coast of Cape Vogel Peninsula, Sep 1954, *Hoogland 4750.* WESTERN PROVINCE: Fly

Accepted for publication 16 August 2005

River, 528 mile Camp, May 1936, *Brass 6752*. **Australia, Queensland.** COOK DISTRICT: Mer (Murray Island) in Torres Strait, 9° 55'S, 144° 02'E, May 2003, *Wannan 2886 & Toh*.

References

BECK, W. (1992). Aboriginal preparation of *Cycas* seeds in Australia. *Economic Botany* 46: 133–147.

CLAUSSEN, J. (2005). *Native Plants of Christmas Island*. Flora of Australia Supplementary Series No. 22. Australian Biological Resources Study: Canberra.

FORSTER, P.I. (2004). The cycads of Queensland – diversity and conservation. *Palms & Cycads* No. 82: 4–28.

HILL, K.D. (1994). The *Cycas rumphii* complex (Cycadaceae) in New Guinea and the Western Pacific. *Australian Systematic Botany* 7: 543–567.

HILL, K.D. (1996). A taxonomic revision of the genus *Cycas* (Cycadaceae) in Australia. *Telopea* 7: 1–64.

HILL, K.D. (1998). Cycadophyta. In P. McCarthy (ed.), *Flora of Australia* 48: 597–661. CSIRO Publications: Melbourne.

HILL, K.D. (2004). *Cycas candida* (Cycadaceae), a new species from Queensland together with an extension of range and amended description of *Cycas yorkiana*. *Telopea* 10: 607–611.

HILL, K.D., STEVENSON, D.W. & OSBORNE, R. (2004). The World List of Cycads. In T. Walters & R. Osborne (eds.), *Cycad Classification: Concepts and Recommendations*, pp. 219–235. CAB International Publishing: Wallingford.

New species of *Commersonia* J.R.Forst. & G.Forst. (Sterculiaceae) from eastern Australia and Vanuatu

G.P. Guymer

Summary

Guymer, G.P. (2005). New species of *Commersonia* J.R.Forst. & G.Forst. (Sterculiaceae) from eastern Australia and Vanuatu. Austrobaileya 7(1): 231–250. Ten new species of *Commersonia* are described: *Commersonia argentea*, *C. beeronensis*, *C. johnsonii*, *C. leiperi*, *C. pearnii*, *C. pedleyi*, *C. reticulata*, *C. rossii* and *C. viscidula* from eastern Australia, and *C. obliqua* from Vanuatu. The new combination *C. novoguinensis* (Gilli) Guymer is made based on *Disaster novoguinensis* Gilli. The new subgenus *Commersonia* subgenus *Verticillata* Guymer is described for the species with deeply 3-lobed petaloid staminodes: *C. fraseri*, *C. rossii*, *C. argentea*, *C. beeronensis* and *C. viscidula*. An epitype is selected for *C. bartramia*. All new taxa are described and most illustrated, with notes on distribution, habitat and conservation status. An identification key to the Queensland species of *Commersonia* is provided.

Key Words: Sterculiaceae, *Commersonia* subgenus *Verticillata*, *Commersonia argentea*, *Commersonia beeronensis*, *Commersonia johnsonii*, *Commersonia leiperi*, *Commersonia novoguinensis*, *Commersonia obliqua*, *Commersonia pearnii*, *Commersonia pedleyi*, *Commersonia reticulata*, *Commersonia rossii*, *Commersonia viscidula*, new species, new combination, taxonomy, Australia, Vanuatu, Papua New Guinea, Queensland

G.P. Guymer, Queensland Herbarium, Environmental Protection Agency, Brisbane Botanic Gardens, Mt Coot-tha Road, Toowong, Queensland 4066, Australia. Email: Gordon.Guymer@epa.qld.gov.au

Introduction

The genus *Commersonia* was described by J.R. Forster and G.A. Forster in *Characteres Generum* (Forster & Forster 1775) and was based on *C. echinata*, a species from Tahiti (Society Islands). However, George Forster in a letter to Christian Voss in 1792 indicated he was the author of the plant descriptions "He [J.R. Forster] had no part in the plant descriptions [for *Characteres Generum*]; I completed them all together with Sparrman, ..." (Hoare 1975: 170).

Commersonia is a genus of about 30 species occurring in south east Asia and the south west Pacific with the majority of its species occurring in Australia. The extra-Australian species include *Commersonia echinata* J.R.Forst. & G.Forst., endemic to Tahiti, *C. obliqua* described here from Vanuatu, *C. novoguinensis* (a new combination in this paper) from montane New Guinea and the widespread *C. bartramia* (L.) Merr. that ranges from China, throughout SE Asia, New Guinea, New Caledonia, Solomon Islands and Australia. The Australian species occur in Western Australia, southern Northern Territory, South Australia, Victoria, New South Wales and Queensland.

The majority of new species described here have been previously recognised or newly discovered and are required for the forthcoming census of Queensland plants. The new species *C. pedleyi* described in this paper has a single staminode or a central and two lateral staminodes between each pair of stamens and its other characters are consistent with the species being positioned in *Commersonia*. The genus *Rulingia* R.Br. was described by Brown (1820) and distinguished from *Commersonia* by having a single staminode between each pair of stamens. The characters of the staminodes of *C. pedleyi* indicate that the genus *Rulingia* requires reassessment with respect to its relationship to *Commersonia*.

Materials and methods

This study is based upon the examination of herbarium material at BM, BRI, CANB, G, K, L, MEL, NSW and P, and for some species field collections and observations by the author. The

Accepted for publication 28 November 2005

herbarium acronyms follow Holmgren *et al.* (1990). All specimens cited have been seen by the author. Bibliographic data are provided for a number of previously described species that some of the new taxa have been confused with in the past, *viz. C. bartramia, C. fraseri, C. leichhardtii*. The latter species is fully described and typified to enable application of the name. One species is resurrected from synonymy under another genus (*viz. C. novoguinensis*).

Measurements are sometimes abbreviated with × indicating length × width. Descriptions of the flowers were prepared from material preserved in spirit or reconstituted material. Common abbreviations in the specimen citations are L.A. (Logging Area), N.P. (National Park), S.F. (State Forest). The abbreviation *NCA* is for the *Queensland Nature Conservation Act 1992* and its associated regulations. The conservation status of species is based on the criteria of the IUCN (2001).

Vegetation terminology for Queensland follows that of the *Vegetation Management Act 1999* and its associated regulations. The abbreviation RE refers to regional ecosystem and the regional ecosystem description database at www.epa.qld.gov.au/REDD.

Taxonomy

Commersonia J.R.Forst. & G.Forst., *Char. Gen.* 43 (1775). **Type:** *C. echinata* J.R.Forst. & G.Forst.

Disaster Gilli, *Ann. Naturhist. Mus. Wien* 83: 454-455 (1980). **Type:** *D. novoguinensis* Gilli

***Distribution*:** About 30 species in Australia, SE Asia, Malesia and Melanesia.

Key to Queensland species of *Commersonia*

1. Flowers with deeply 3-lobed petaloid staminodes; capsules with 5 chartaceous wings 2–6 mm long (subg. *Verticillata*) **2**
Flowers with filiform lateral staminodes less than half as long as central staminode lobe or rarely only with one staminode between each pair of the stamens; capsules without chartaceous wings or with 5 short papery upper wings 1.5–2 mm long (*C. pedleyi*) (subg. *Commersonia*) **5**

2. Leaves and inflorescences with mixture of red glandular hairs and stellate hairs. SE Qld & NE NSW . . . . . **1. C. viscidula**
Leaves and inflorescences with predominantly stellate hairs **3**

3. Leaves glaucous above. Central Qld . . . . . **2. C. argentea**
Leaves green above **4**

4. Branchlets, leaves and inflorescences with golden brown indumentum; petals 4.5–4.8 mm long; ovules 6 per loculus. SE Qld . . . . . **3. C. beeronensis**
Branchlets, leaves and inflorescences with cream or pale brown indumentum; petals 5–5.5 mm long; ovules 8 per loculus. SE Qld, NSW . . . . . **4. C. fraseri**

5. Trees or rarely a montane shrub 2 m high; leaves 9–24 × 6–13 cm, inflorescences 4–12 cm long, 50–100-flowered. E Qld, NE NSW . . **6. C. bartramia *sens. lat.***
Shrubs, prostrate or erect to 1 m high; leaves 1.4–11.5 × 0.4–5 cm; inflorescences 1–2.3 cm long, 1–10-flowered **6**

6. Flowers red; leaves glaucous, ovate to ovate-lanceolate, 3.5–7 × 1.5–5 cm. NE Qld . . . . . **9. C. reticulata**
Flowers white, yellow, pink or pale green; leaves 1.4–11.5 × 0.4–3 cm **7**

7. Flowers 14–17 mm diameter. Central Qld . . . . . **10. C. johnsonii**
Flowers 4.5–7 mm diameter **8**

8. Leaves glaucous and velutinous above, margins markedly undulate; peduncles 0.9–1.2 mm long. Central subcoastal Qld ..... **11. C. pearnii**
Leaves green and pubescent above, margins not markedly undulate; peduncles 3–8 mm long **9**

9. Flowers pink; leaves lobed. S inland Qld ..... **14. C. pedleyi**
Flowers white or yellow; leaves serrate or crenate **10**

10. Flowers white, 6–7 mm diameter; leaf blades lanceolate, 1.5–11.5 × 0.4–1.6 cm. SE Qld ..... **12. C. leiperi**
Flowers yellow, 12–15 mm diameter; leaf blades ovate to lanceolate, 3.5–8.5 × 1–3 cm. Central eastern Qld ..... **13. C. leichhardtii**

Commersonia subgenus **Verticillata** Guymer, **subg. nov.** affinis subgeneri Commersoniae sed staminodiis profunde trilobis petaloideis, pedicellis articulatis et capsulis 5-alatis differt. **Typus:** *Commersonia viscidula* Guymer.

***Notes*:** The subgenus differs from subgenus *Commersonia* by its deeply 3-lobed petaloid staminodes, the articulate pedicels and 5-winged capsules. It contains 5 species and is restricted in distribution to eastern subtropical Australia.

***Etymology*:** The subgenus name *Verticillata* refers to the upper half of the whorled central staminodes being radiate while the lower half enclose the ovary.

1. Commersonia viscidula Guymer, **sp. nov.** affinis *C. fraseri* sed ab ea foliis ramulis inflorescentiis calycibus viscidis differt.

Typus: Queensland. Wide Bay District: Mt Tinbeerwah, between Cooroy and Tewantin, 26° 24'S, 152° 59'E, 4 October 1981, *G.P. Guymer 1614* (holo: BRI; iso BRI, CANB, K, MEL, NSW, PERTH).

Commersonia sp. 1 (Stanley & Ross 1986).

Commersonia sp. (Mt Tinbeerwah G.P. Guymer 1786) (Guymer 2002).

Spreading shrub 1–3 m, multistemmed, bark grey with viscid branchlets, leaves, inflorescences and calyces (glandular hairs usually red, 0.5–2.8 mm long), suckering from rhizomes; branchlets pubescent (hairs stellate 0.3–0.6 mm diameter, red-glandular 1–2 mm long), glabrescent. Leaves pale green above, glaucous below; blades ovate or ovate-lanceolate, occasionally lower leaves 3-lobed, 5–16 × 2.5–8.5 (–13) cm; margins undulate, crenate to serrate, teeth 20–34 pairs, up to 2 mm long; bases truncate or slightly cordate or oblique; apices acute; pubescent above (hairs mid-dense, stellate 0.2–2.4 mm diameter, red-glandular 0.1–0.7 mm long) and velutinous below (hairs stellate 0.4–1.4 mm diameter, red-glandular 0.2–0.8 mm long on midvein and lateral veins); 5-veined at base, venation slightly impressed above, raised below, lateral veins 7–9 pairs; petioles 6–15 mm long, pubescent (hairs stellate & red-glandular). Stipules linear-triangular, 3–10 × 1–2 mm, pubescent (hairs stellate & red-glandular). Inflorescences 10–30-flowered, 3.5–8 cm long; peduncles 6–25 mm long; bracts lanceolate, 5–7 × 0.7–1.2 mm. Flowers white, sepals sometimes with a pale pink flush, 7–10 mm diameter; pedicels 4–9 mm long, articulate below the middle. Calyces 3.8–4.2 mm long, pubescent outside (hairs stellate & red-glandular), puberulous inside (hairs simple & red-glandular); lobes ovate-acute, 2.2–3.2 × 2.4–3.6 mm. Petals 3.5–5 mm long, central lobe spathulate or obovate, margins undulate, apex shallowly 2–4-lobed, 2.9–3.8 mm long, 1.7–2 mm wide at apex, 0.7–0.8 mm wide at base; lateral lobes rounded, 0.8–1.1 × 0.9–1.2 mm. Staminal tube 0.4–0.6 mm long; central staminodes narrowly spathulate, 4–6 mm long, apex 0.6–0.7 mm wide, middle *c.* 0.2 mm wide, 0.8–1 mm wide at base, lower half forming a cone over the ovary, upper half radiate; lateral staminodes linear-spathulate, 2–3 mm long, 0.12–0.16 mm wide at base, 0.2–0.4 mm wide near apex. Ovary ovoid, 1.1–1.3 mm diameter, glabrous or with rudimentary bristles and stellate hairs, 5-lobed and 5-winged, margins of sutures pink or red,

ovules 3 or 4 per loculus; styles coherent at apex, 0.4–0.5 mm long; stigmas globular, 0.1–0.12 mm diameter. Capsules dark brown 18–28 mm diam., 5-winged, wings chartaceous, 4–6 mm long; bristles 2.5–6 mm long, with stellate and simple hairs. Seeds 1–3 per loculus, black, obovoid, angular, 2.5–2.8 × 1.8–2 mm, smooth with fine longitudinal striations; strophiole fawn or pale yellow, 1–1.3 mm long. **Fig. 1**.

Fig. 1. ***Commersonia viscidula***. A. flowering branchlet. × 0.8. B. open flower. × 8. C. young flower before staminodes open. × 8. All from *Guymer 1853* (BRI).

Additional specimens examined **(total of 28 seen): Queensland**. Burnett District: Track to Coongarra Rock, 11.5 km ENE of Coalstoun Lakes, 25° 34'S, 151° 59'E, Sep 2002, *Forster PIF28849* (BRI); Summit of Coongarra Rock, S.F. 1344, 25° 39'S, 151° 58'E, Mar 1994, *Thomas COO1* (BRI). Wide Bay District: Woowonga Creek, foothills of Woowonga Range, 25° 29'S, 152° 08'E, Oct 1995, *Young 2040* (BRI); Summit of Mt Walsh, Mt Walsh N.P., 25° 34'S, 152° 03'E, Aug 1996, *Forster PIF19549* (BRI); Towards the top of Biggenden Bluff, Oct 1930, *White 7327* (BRI); 1.5 km SSW of Biggenden Bluff, Mt Walsh N.P., 25° 35'S, 152° 01'E, Sep 2002, *Bean 19232* (BRI); Summit of Mt Tinbeerwah, Tewantin S.F. 959, 26° 23'S, 152° 58'E, Aug 1994, *Grimshaw G902* (BRI); Mt Tinbeerwah, Apr 1962, *Everist 7166* (BRI); *loc. cit.*, Aug 1982, *Guymer 1780* (BRI); *loc. cit.*, *Guymer 1786* (AD, BRI, CANB, NSW); *loc. cit.*, Jan 1970, *Henderson H533* (BRI). **New South Wales.** Northern Tablelands: Severn River Gorge, W of Appletree Flat, 29° 08'S, 150° 59'E, Dec 1990, *Bean 2761* (BRI); 8.5 km along Upper Rocky River road, 29° 10'S, 152° 14'E, *c.* 40 km SE of Tenterfield, Dec 2003, *Bean 21455* (BRI). North Coast: Macleay River, Nov 1906, *Boorman s.n.* (BRI [AQ81584], G, NSW); Gloucester Buckets, Sep 1897, *Maiden s.n.* (NSW, W); Darkey Creek, 35 km SW of Singleton, Dec 1976, *Guymer 841* (BRI); *loc. cit.*, Oct 1970, *Fisher 262* (BRI); Nymboida N.P., 29° 40'S, 152° 31'E, W of Grafton, *s.dat.*, *s.coll.* (BRI); Old Darkey Creek, *c.* 35 km S of Singleton on Windsor road, Feb 1980, *Williams s.n.* (BRI [AQ780689]); Parsons Creek, between Howes Valley & Bulga, Feb 1963, *Pullen 3804* (BRI).

Distribution and habitat: *Commersonia viscidula* occurs from Woowonga Range, south-east Queensland to Bulga, central coast of New South Wales. It grows in open shrublands, heathlands dominated by *Leptospermum microcarpum*, woodlands and eucalypt forests. The species is found on hills, upper slopes and along creeks on soils varying from rock pavements, to sandy or alluvial.

Phenology: Flowers have been collected from August to April and fruits in August, October, December, February to April.

Affinities: *Commersonia viscidula* is related to *C. fraseri* but differs from that species in its viscid leaves, branchlets, inflorescences and calyces.

Conservation status: The species has a wide distribution and is represented in conservation areas across its distributional range. It is not considered to be at risk.

Etymology: The epithet is derived from the Latin word *viscidulus*, referring to the sticky leaves, branchlets and inflorescences that characterise this species.

2. Commersonia argentea Guymer, **sp. nov.** affinis *C. fraseri* sed ab ea ramulis foliis inflorescentiisque argenteis velutinis differt.

Typus: Queensland. Burnett District: 0.3 km E of Cadarga intersection on road to Allies Creek, 16 November 1981, *G.P. Guymer 1642* (holo: BRI; iso: BRI, K, MEL, NSW).

Commersonia sp. 2 (Stanley & Ross 1986).

Commersonia sp. (Cadarga G.P.Guymer 1642) (Guymer 2002).

Shrub 1.5–4 m tall, suckering from rhizomes; branchlets silvery velutinous (stellate hairs 0.2–1.2 mm diameter, and occasional glandular hair to 0.2 mm long). Leaves silvery or glaucous, discolorous; blades ovate to ovate-acute, (2.5–) 3.5–13 × (1–) 2–7.5 (–8) cm; margins crenulate, teeth 34–39 pairs, up to 1 mm long; bases cordate or truncate and oblique; apices obtuse; white stellate-velutinous above (hairs 0.2–0.7 mm diameter) and below (hairs 0.15–0.4 mm diam.); 5-veined at the base, midvein and lateral veins slightly impressed above, veins raised below, lateral veins 6–7 pairs; petioles 4–8 mm long, stellate-velutinous. Stipules triangular, 4–6 × 0.7–1 mm, early deciduous, stellate-pubescent. Inflorescences 10–30-flowered, 2–5 cm long; peduncles 10–20 mm long; axes white stellate-velutinous (hairs 0.15–0.7 mm diameter & glandular hairs to 0.4 mm long). Flowers white or cream, 9–10 mm diameter; pedicels 9–11 mm long, articulate 3.5–3.8 mm from flower base. Calyx lobes 2.7–3 × 1.9–2.2 mm, white stellate-velutinous outside, sparsely puberulous inside. Petals 4.5–5.1 mm long, central lobe spathulate, shallowly 3 or 4-lobed at apex, margins undulate, 3.5–3.8 mm long, 0.9–1.0 mm wide at base, 1.2–1.3 mm wide at apex, lateral lobes rounded, 1.1–1.3 × 0.7–0.8 mm. Staminal tube 0.5–0.6 mm long. Staminodes: central spathulate, 4.6–5.3 mm long, 0.2–0.3 mm wide in middle, 0.7–0.8 mm wide at base, apex 0.5–0.6 mm wide and shallowly 3-lobed, lobes rounded; laterals linear-spathulate, 3.8–4.3 mm long, *c.* 0.1 mm wide in lower half and 0.3 mm

wide near apex. Ovary 5-lobed and 5-winged, 0.9–1 mm diameter, with rudimentary bristles and stellate hairs; ovules 6 per loculus; styles *c.* 0.5 mm long, free; stigmas clavate, free, *c.* 0.08 mm diameter. Capsules and seeds not seen.

***Additional specimens examined*: Queensland.** MITCHELL DISTRICT: Bull Creek Gorge, Sep 1984, *O'Keeffe s.n.* (BRI [AQ418119]). LEICHHARDT DISTRICT: 40 km N of Arcadia Valley, Mar 1990, *Ambrose s.n.* (BRI [AQ470721]); Nogoa River Gorge, Mt Playfair Holding, Nov 1985, *Don s.n.* (BRI [AQ398750]); Injune - Rolleston road, 86 km N of Injune, Mar 1994, *Halford Q2161* (BRI); Castlevale Station, W of Springsure, Feb 1984, *Jackes s.n.* (BRI [AQ544572]); 70 km E of Tambo, road to Salvator Rosa N.P., Nov 1989, *McRobert s.n.* (BRI [AQ459483]). BURNETT DISTRICT: 0.3 km E of Cadarga intersection on road to Allies Creek, Nov 1981, *Guymer 1642* (BRI, K, MEL, NSW); Kragra district, Feb 1980, *Hando 137* (BRI); Kragra, near Chinchilla, Jan 1980, *Lithgow 687* (BRI); Cadarga, Dec 1981, *Lithgow 1009* (BRI).

***Distribution and habitat*:** *Commersonia argentea* is confined to central and south east Queensland from the Carnarvon Range to the Chinchilla area where it is a component of eucalypt open forest on ridges, or undulating terrain or along watercourses and occurs in sandy soils. It is often found in stands that can cover up to an hectare due to its suckering from rhizomes.

***Phenology*:** Flowers have been recorded from November to January, and in March.

***Affinities*:** *Commersonia argentea* is related to *C. fraseri* but differs from that species by is silvery velutinous branchlets, leaves and inflorescences.

***Conservation status*:** This species has a sporadic distribution but has numerous plants at most locations due to its suckering habit. It occurs near the National Park estate but has not yet been conserved. It is not considered to be at risk.

***Etymology*:** The specific epithet *argentea* (Latin for *silver*) refers to the silver coloured leaves of this species.

3. Commersonia beeronensis Guymer, **sp. nov.** affinis *C. fraseri* sed ab ea foliis ramulis inflorescentiisque aureis pubescentibus differt.

Typus: Queensland. BURNETT DISTRICT: Beeron Holding, Pretty Face Mountain, 11 September 1996, *P.I. Forster PIF19610* (holo: BRI; iso: BRI, K, MEL, NSW).

Commersonia sp. (Beeron P.I.Forster PIF4658) (Guymer 2002).

Shrub 1–2.5 m tall, suckering from rhizomes; branchlets golden pubescent (stellate hairs 0.3–1 mm diameter), glabrescent. Leaves green, paler below; blades entire or lower leaves sometimes 3-lobed, ovate to lanceolate 5–12 × 1–4 cm; margins denticulate, teeth 24–30 pairs, up to 1 mm long; bases truncate or sometimes cordate; apices acuminate; pubescent above (hairs mid-dense, stellate 0.4–0.8 mm diameter, glandular <0.1 mm long), golden brown stellate pubescent below (stellate hairs 0.5–1.2 mm diameter); 5-veined at the base, midvein and lateral veins slightly impressed above, veins raised below, lateral veins 5–8 pairs; petioles stellate-pubescent, 4–7 mm long. Stipules triangular or ovate, 1.5–6 × 0.7–1 mm, early deciduous, stellate-pubescent. Inflorescences 9–24-flowered, 2–5 cm long; peduncles 6–10 mm long, stellate-pubescent. Flowers cream, 6–7 mm diameter; pedicels 2.5–5 mm long, articulate 1–1.5 mm from flower base. Calyx lobes triangular, 2–2.2 × 2–2.5 mm, stellate-pubescent outside, sparsely puberulous inside. Petals 4.5–4.8 mm long; central lobe obovate, entire, 3.5–3.8 mm long, 1.2–1.5 mm wide at apex, 0.7–0.8 mm wide at base; lateral lobes rounded, 0.8–0.9 × 0.9–1 mm. Staminal tube 0.3–0.4 mm long; central staminodes narrowly spathulate, 5–5.3 mm long, 0.2–0.3 mm wide in middle, 1.1–1.3 mm wide at base, apex 0.5–0.6 mm wide; lateral staminodes linear-spathulate, 3.8–4 mm long, *c.* 0.1 mm wide in lower half and 0.3 mm wide near apex. Ovary 5-lobed and 5-winged, 0.8–0.9 mm diameter, with rudimentary bristles and stellate hairs; ovules 6 per loculus; styles twisted, 0.5–0.6 mm long, coherent at apex; stigmas clavate, free, *c.* 0.06 mm diameter. Capsules 5-winged, 18–22 mm diameter, dark brown, wings chartaceous, 4.5–6 mm long; bristles 1.4–2.1 mm long, with stellate hairs. Seeds 1–3 per loculus, ovoid and angular, tuberculate, 2.5–2.9 × 1.9–2.1 mm, dark brown to black; strophiole 0.8–1.1 mm long, fawn or tan. **Fig. 2.**

Fig. 2. ***Commersonia beeronensis***. A. flowering branchlet. × 1. B. flower. × 8. A from *Halford Q1810* (BRI); B from *Forster PIF4658* (BRI).

Additional specimens examined: **Queensland.** Burnett District: 3 km WNW of Manar Homestead, Aug 1988, *Forster PIF4658* (BRI), Beeron Holding, 5 km WSW of Toondahra Homestead, Sep 1989, *Forster PIF5760* (BRI), Beeron Holding, 7 km W of Toondahra Homestead, Aug 1990, *Forster PIF7125* (BRI), Beeron Holding, 45 km S of Mundubbera, Nov 2001, *Franks AJF011014* (BRI), Beeron Holding, 'Rocky Paddock', 47.8 km SSW of Gayndah, Aug 1993, *Halford Q1810* (BRI).

Distribution and habitat: *Commersonia beeronensis* is confined to National Park (previously Beeron Holding), in SE Queensland. It occurs on granite outcrops, on slopes and at base of granite domes in open forests and woodlands dominated by *Eucalyptus dura, E. petalophylla, E. acmenoides* and *Lophostemon confertus* (RE 11.12.20).

Phenology: Flowers and fruits have been collected in August, September and November.

Affinities: *Commersonia beeronensis* is related to *C. fraseri* but differs from that species by the golden pubescent branchlets, leaves and inflorescences.

Conservation status: *Commersonia beeronensis* is known only from Beeron Holding that is now a National Park. It is an uncommon plant where it occurs in the Park and is currently listed as Vulnerable under the *NCA*. Severe wildfires kill the above ground parts of this plant with regeneration occurring from subterranean suckers and seed.

***Etymology*:** The specific epithet refers to Beeron Holding, the only known location for the species.

4. Commersonia fraseri J.Gay, *Mem. Mus. Par.* 10: 215-216, t.4 (1824); *Commersonia fraseri* J.Gay var. *fraseri*, *Mem. Mus. Par.* 10: 216 (1824); *C. fraseri* var. *macrophylla* J.Gay, *Mem. Mus. Par.* 10: 216-218, t. 4.1 (1824). **Type:** "Habitat in Novae Hollandiae Nova Walesia meridionali … .Cl. Fraser [553]" (holo: P; iso: K).

Commersonia fraseri var. *microphylla* J.Gay, *Mem. Mus. Par.* 10: 218, t. 4.2 (1824). **Type:** "Nullum huic specimini numerum apposuit Cl. Fraser" (holo: P).

***Notes*:** Gay described *Commersonia fraseri* based on two specimens collected by Charles Fraser and given to Gaudichaud on his visit to Australia on Freycinet's voyage 1817–1820. Gay recognised two varieties of *C. fraseri*, var. *macrophylla* and var. *microphylla* but not a type variety. The detailed description of *C. fraseri* var. *macrophylla* indicates this to be the type variety. Gay indicated his *C. fraseri* var. *microphylla* was possibly a proper species "an species propria?".

5. Commersonia rossii Guymer, **sp. nov.** affinis *C. fraseri* sed ab ea foliis majoribus et trichomatibus stellatus majoribus (0.5–1.8 mm diametro) in ramulis, inflorescentiis et floribus differt.

Typus: New South Wales. South Coast: On the southern side of the Lochiel – South Pambula road, *c.* 2 km E of Lochiel, 4 October 1985, *D.E. Albrecht 2047* (holo: MEL; iso: BRI).

Commersonia sp. 1 (Short 1996).

Shrub or small tree, 4–10 m tall, suckering from rhizomes; branchlets rusty brown stellate-tomentose (hairs 1.2–1.8 mm diameter). Leaves green, paler below; blades ovate to ovate-lanceolate, 6.5–25 (–31) × 2.8–15 (–26) cm; margins irregularly crenate, teeth 15–30 pairs, up to 3 mm long; bases truncate or cordate; apices acuminate; pubescent above (hairs sparse to mid-dense, stellate 0.1–1.8 mm diameter as well as simple), stellate-tomentose below (hairs 0.2–1.3 mm diameter); 5- or 7-veined at the base, midvein and lateral veins slightly impressed above, veins raised below, lateral veins 7–9 pairs; petioles 9–20 (–32) mm long, stellate-tomentose. Stipules triangular, 3–10 × 1–4 mm long, early deciduous, stellate-pubescent. Inflorescences 18–60-flowered, 3.5–9 cm long; peduncles (3–) 10–22 mm long; bracts ovate-lanceolate, acute, 2.8–6 × 0.9–1.7 mm; axes rusty brown stellate-tomentose (hairs 0.5–0.8 mm diameter). Flowers white or cream, sepals occasionally pale pink, 9–11 mm diameter; pedicels 2.5–5.5 mm long, articulate 1.2–3 mm from flower base. Calyces stellate-pubescent outside, puberulous inside, 4.5–4.8 mm long; lobes ovate-acute, 3.5–4.5 × 2.4–2.8 mm wide. Petals obovate, entire or 2-lobed at apex, 4.3–4.5 mm long; central lobe spathulate, 2.8–3.1 mm long, 0.4–0.6 mm wide in middle, 1.6–1.7 mm wide at apex; lateral lobes rounded, 1–1.2 × 0.9–1 mm long. Staminal tube 0.3–0.4 mm long; central staminodes spathulate, margins undulate, apex 2 or 3-lobed (lobes to *c.* 0.5 mm long), 5–6 mm long, 0.3–0.35 mm wide in middle, 0.7–0.9 mm wide at base, apex 0.7–1.3 mm wide; laterals linear-spathulate, entire or 2-lobed (lobes to *c.* 0.5 mm long), 3–4 mm long, 0.1–0.15 mm wide in lower half, 0.4–0.7 mm wide near apex. Ovary 5-lobed and winged, 1–1.3 mm diameter, with rudimentary bristles and stellate hairs; ovules 8 per loculus; styles 0.5–0.6 mm long, coherent at the top; stigmas clavate, free, *c.* 0.8 mm diameter. Capsules 5-winged, 15–25 mm diameter.

***Additional specimens examined*:** **New South Wales.** South Coast: Near Egans Peak Nature Reserve, Sep 1984, *Albrecht 912* (BRI, MEL); Lochiel – South Pambula road, *c.* 2 km E of Lochiel, Oct 1985, *Albrecht 2047* (BRI, MEL); 8.2 km W along Broadwater road from Princess Highway, Oct 1991, *Albrecht 4769* (BRI, MEL); Mt Dromedary road, SW of Narooma, Oct 1963, *Adams 687* (BRI, CANB, E, L); 6.4 km E of Bega, Oct 1984, *Stewart 154 & Whigham* (BRI, CANB); Deep Creek, Eden – Bombala road, Jun 1959, *Webb & Tracey 3642* (BRI). **Victoria.** Gippsland: Combienbar road, 2 miles [3.3 km] NE of junction of Errinundra road, Sep 1970, *Beauglehole ACB34205* (BRI, MEL).

***Distribution and habitat*:** *Commersonia rossii* is confined to the South Coast, New South Wales to East Gippsland, Victoria. It occurs in wet sclerophyll forest, open forest, riparian forests dominated by *Tristaniopsis laurina* and the margins of warm-temperate rainforest.

***Phenology*:** Flowers have been collected in August and September.

***Affinities*:** *Commersonia rossii* is related to *C. fraseri* but differs from that species by its larger leaves (6.5–25 × 2.8–15 cm), and larger stellate indumentum (hairs 0.5–1.8 mm diameter) on the branchlets, leaves and inflorescences.

***Etymology*:** Named in honour of Dr Jim Ross, Chief Botanist, National Herbarium of Victoria.

Commersonia subgenus **Commersonia**

Type: *Commersonia echinata* J.R.Forst. & G.Forst.

6. Commersonia obliqua Guymer, **sp. nov.** affinis *C. echinatae* sed ab ea foliis velutinis lanceolatis usque triangulari-lanceolatis, apicibus anguste acuminatis et foliorum basibus valde manifestis obliquis differt.

Typus: Vanuatu. Efate Island: Undine Bay, 28 April 1928, *S.F. Kajewski 238* (holo: BRI; iso: K, P).

Shrubs or trees 3–15 m tall; branchlets stellate-pubescent (hairs 0.15–0.5 mm diameter), glabrescent. Leaves green, glaucous below; blades lanceolate or triangular-lanceolate, glabrous above except for a few scattered hairs along primary veins, white or pale grey velutinous below (stellate hairs 0.1–0.2 mm diameter), (3–) 5–17.7 × 1.8–6.2 cm; apices narrowly acuminate; bases cordate and markedly oblique; margins irregularly serrate, teeth to 2 mm long; midvein and lateral veins slightly sunken above, raised below; petioles 4–11.5 mm long, pubescent. Stipules narrowly triangular, 2.5–6 × 0.5–1.2 mm, early deciduous, stellate-pubescent. Inflorescences 2.5–5.7 cm long, stellate-pubescent. Flowers white, 5–6 mm diameter. Sepals stellate-pubescent, glabrous at base inside; lobes broadly-ovate, acute, 1.3–2.0 mm long, 1.7–2.5 mm wide; petals 2.5–3.3 mm long, tube 0.9–1.1 mm long, ligule 1.7–2 mm long, 0.4–0.5 mm wide, glabrous outside, stellate-puberulent inside. Staminal tube 0.4–0.5 mm long; central staminodes lanceolate, acute, 1.6–2.1 × 0.5–0.7 mm; lateral staminodes 0.5–0.75 mm long, stellate-puberulent. Ovary 5-lobed, *c.* 0.8 mm diameter; ovules (2–) 4 per loculus; styles connate above, free below, 0.45–0.55 mm long; stigmas capitate. Capsules 27–32 mm diameter, bristles 7–12 mm long, stellate-pubescent. Seeds 2 per loculus, botuliform, 2.5–2.7 × 1.5–17 mm, dark brown to black; strophiole pale yellow, filamentous (5–8), 2–2.5 mm long. **Fig. 3A**.

***Additional specimens examined*: Vanuatu.** Efate Island: Undine Bay, Apr 1928, *Kajewski 238* (BRI, K, P); *loc. cit.*, Aug 1896, *Morrison s.n.* (K). Erromango Island: Umbornale, Jul 1930, *Cheeseman 5* (K); Nouankao River & vicinity, Aug 1971, *Chew Wee-Lek RSNH 139* (K); between Nouankao Camp & Ipota, *c.* 10 km E of Ipota, Aug 1971, *Green RSNH 1312* (K, P); Camp 5, Nevel, Jul 1966, *Johnson 2* (K, P); Dillous Bay, Jul 1896, *Morrison s.n.* (K); tableland, July 1896, *Morrison s.n.* (K). Tanna Is: May 1968, *Bernardi 13124* (K, P, W). Aneityum Island: 3 miles [5 km] NE of Anelgauhat, in 1955, *Cheeseman s.n.* (BM, P); Oct 1858, *McGillivray 5* (BM, P); Anelgauhat, 5 & 13 June 1896, *Morrison s.n.* (K); Anumy Valley, W side, Jun 1896, *Morrison s.n.* (K); S of Ithurum, Jun 1896, *Morrison s.n.* (K); S of Eili, Jul 1971, *Raynal RSNH 16135* (K); Oct 1858, *Saunders 5* (K); Anelgauhat Bay, Sep 1929, *Wilson in Kajewski 958* (K, P).

***Distribution and habitat*:** *Commersonia obliqua* is known from Vanuatu in tropical lowland rainforest.

***Phenology*:** Flowers have been collected in April to September and fruits from April to October.

***Affinities*:** *Commersonia obliqua* is allied to *C. echinata* from Tahiti but differs from that species by its lanceolate to triangular-lanceolate velutinous leaves, narrowly acuminate leaf apices and markedly pronounced oblique leaf bases.

***Etymology*:** The epithet is from Latin *obliquus* referring to the markedly oblique leaf bases.

7. Commersonia bartramia (L.) Merr., *Interpr. Rumph. Herb. Amboin.* 362 (1917); *Muntingia bartramia* L., *Amoen. Acad.* 4: 124 (1759). **Type:** Illustration of *Restiaria alba* by Rumphius, *Herb. Amboin.* 3: t. 119 (1743). **Epitype** [here chosen]: Indonesia. Ambon: Kolukken, 1 April 1918, *Kornassi 1071* (BRI; isoepi: K, P).

***Distribution*:** This species is widespread throughout Asia from China, throughout SE Asia, New Guinea, Solomon Islands, New Caledonia, Fiji and Australia.

***Notes*:** The illustration of *Restiaria alba* in Rumphius (*loc. cit.*) is stylised and lacks detail. An epitype (*Kornassi 1071*) is selected to supplement the illustration and fix the application of the name *Commersonia bartramia.*

The degree of variation shown in leaf and floral characters of specimens currently referred to *Commersonia bartramia* indicate that further taxa may be included in this complex.

Fig. 3. ***Commersonia novoguinensis***. A. flowering branchlet. × 0.75. ***Commersonia obliqua***. B. fruiting branchlet. × 0.75. A from *Craven & Schodde 1332* (BRI); B from *Kajewski 958* (BRI).

8. Commersonia novoguinensis (Gilli) Guymer, **comb. nov.**

Disaster novoguinensis Gilli, *Ann. Naturhist. Mus. Wien* 83: 454–455 (1980). **Type:** Papua New Guinea. Bachufer bei Kompiam, 1650m, February 1974, *A. Gilli G557* (holo: W).

***Notes*:** This species was described by Gilli under a new genus and subsequently placed in the synonymy of *Commersonia bartramia* by van Steenis (1982). The species is allied to *C. bartramia* but differs from that species in its ferruginous branchlets, leaves, inflorescences, flowers and fruits, and by its strongly reticulate veins and leaves being glabrescent above. **Fig. 3B**.

***Additional specimens examined*: Papua New Guinea.** Western Highlands Province: 1 mile [1.6 km] S of Birip on Kompiam-Wabag Road, May 1965, *Flenley ANU2815* (K, L); Near Yogos village, lower Tale valley, Jun 1960, *Hoogland & Schodde 6660* (BRI); Kopiago, 5° 22'S, 142° 33'E, Nov 1968, *Vandenberg & Galore NGF42051* (BRI, CANB, L, K); Sirunki, pathway to swamp, below Kaiamanda corner, Aug 1962, *Walker ANU594* (K, L); Wurup area, 10 miles [16 km] SE of Mt Hagen, Jul 1966, *Wheeler ANU6219* (BRI, CANB, K, L); Kompiam, Jul 1959, *Womersley NGF11250* (BRI); Between Kompiam & Porget, 5° 30'S, 143° 40'E, Jul 1959, *Womersley NGF11251* (BRI, K). Eastern Highlands Province: Mt Wilhelm, July 1959, *Brass 30767* (K, L); Keglsugl, 6° 00'S, 145° 00'E, Feb 1964, *Millar NGF23108* (BRI, CANB, L); Pengagl Creek, 5° 45'S, 145° 05'E, Aug 1964, *Sayers & Millar NGF19927* (BRI, CANB, L); Above Keglsugl, 5° 50'S, 145° 05'E, May 1966, *Streimann, Kairo & Maniak NGF27751* (BRI, CANB, K, L). Morobe Province: near Haumga, Apr 1966, *Craven & Schodde 1107* (BRI, CANB, K, L); Headwaters of Langimar River, Apr 1966, *Craven & Schodde 1332* (BRI, K, L); Edie Creek road, *c.* 4 miles [6.7 km] SW of Wau, Oct 1963, *Hartley 12304* (BRI); Near Wagau airstrip, Dec 1963, *Sayers sub Hartley 12585* (BRI); Wagau, 6° 45'S, 146° 50'E, Nov 1963, *Womersley NGF17821* (BRI, CANB, L). Southern Highlands Province: near Kiburu, Mendi Valley, Jul 1961, *Schodde 1429* (K, L). Central Province: Between Efogi & Launumu, 9° 09'S, 147° 40'E, Oct 1973, *Croft & Lelean LAE60557* (BRI, CANB, K, L); Mt Pigini, SE of Efogi, 9° 10'S, 147° 35'E, Sep 1970, *Stevens LAE50445* (BRI, CANB, K, L).

***Distribution and habitat*:** *Commersonia novoguinensis* is restricted to Papua New Guinea at altitudes of between 1200–3000 m from Kopiago in the Western Highlands Province to Efogi in Central Province and occurs in montane rainforest, on rainforest margins and in eucalypt forest.

***Phenology*:** Flowers have been collected in April to July and September to November, with fruits collected in February, May, July, August and December.

9. Commersonia reticulata Guymer, **sp. nov.** affinis *C. leiperi* et *C. pearnii* sed ab iis floribus rubris, staminodiis erectis lateralibus et foliis ovatis usque ovato-lanceolatis differt.

Typus: Queensland. North Kennedy District: Princess Hills section, Lumholtz National Park, 18° 19'S, 145° 25'E, 10 April 2005, *P.I. Forster PIF30680 & K.R. McDonald* (holo: BRI; iso: AD, BRI, CANB, DNA, K, L, MO, MEL, NE, NSW, PERTH).

Shrubs or subshrubs 0.3–1 m tall, suckering from rhizomes; branchlets pubescent (hairs stellate, 0.4–1.2 mm diameter), glabrescent. Leaves glaucous or silvery, paler below; blades broadly ovate to ovate-lanceolate, rarely 3-lobed, (3–) 3.5–7 × 1.5–5 cm; margins irregularly crenate, teeth 7–20 pairs, to 2 mm long; bases cordate; apices obtuse or rounded; tomentose above (stellate hairs 0.5–1.25 mm diameter) and below (stellate hairs 0.75–1.5 mm diam.); 5-veined at the base, veins raised below, impressed above, lateral veins 5–6 pairs; petioles 4–7 mm long. Stipules narrowly triangular, 5–8 mm long, stellate-pubescent. Inflorescences 2–5-flowered, 10–15 mm long; peduncles 3–3.5 mm long; axes stellate-pubescent (hairs 0.6–1.2 mm diameter); bracts linear-triangular, 4–6 × 0.3–0.5 mm wide, stellate-pubescent. Flowers red or bright red, 9–11 mm diameter, pedicels 0.2–0.3 mm long. Calyces 5–5.5 mm long, stellate-pubescent outside, pubescent inside (hairs stellate & glandular); lobes ovate-acute, 2.9–3.2 × 3.8–4 mm. Petals obovate, 4–4.5 mm long; central lobes rounded, 1.4–1.5 × 2–2.4 mm; lateral lobes rounded, 1.1–1.2 × 1.1–1.2 mm long. Staminal tube 1.8–2 mm long; central staminodes ovate-acute, 3.5–3.8 × 1–1.2 mm; lateral staminodes filiform, smooth or minutely papillate, erect, 0.7–0.8 × 0.15–0.16 mm. Ovary slightly 5-lobed, 1–1.5 mm diameter, with rudimentary bristles; ovules 6 per loculus; styles 1–1.2 mm long; stigmas capitate, 0.15–0.2 mm diameter. Capsules and seeds not seen. **Fig. 4.**

***Additional specimens examined*: Queensland.** North Kennedy District: Cashmere [Creek], Rockingham Bay, *s.dat.*, *Armit* s.n. (MEL 2126043); Princess Hills access road, Lumholtz N.P., Jul 1998, *Bean 13723*[1] (BRI, MEL); High Range, W of Townsville, Jan 1997, *Cumming 15495*[2] (BRI); 43 km along Gunnawarra to Minnamoolka road from junction with Kennedy Development road, just N of Wombinoo entrance, 18° 03'S, 145° 12'E, Apr 2005, *Forster PIF30657 & McDonald*[3] (BRI, DNA, NSW, MEL); Between Minnamoolka and Gunnawarra, Jan 1976, *Hyland 8606*[3] (BRI, QRS); *c.* 40 miles [66.7 km] S of Mt Garnet, Oct 1967, *Morain 199*[3] (BRI); Princess Hills, Lumholtz N.P., May 1996, *Williams 574*[1] (BRI).

***Distribution and habitat*:** *Commersonia reticulata* is known from south of Mt Garnet to Townsville in north-east Queensland. It occurs in mixed open forest to woodland commonly including *Corymbia clarksoniana, Eucalyptus portuensis, E. crebra* and *Corymbia citriodora* on red kandosols on Tertiary surfaces (RE 9.5.5) or mixed open forest including *Eucalyptus portuensis, E. crebra, Corymbia clarksoniana* and *C. citriodora* on shallow soils on metamorphic hills and ranges (RE 9.11.4).

***Phenology*:** Flowers have been recorded for January, April, May, July and October.

***Affinities*:** *Commersonia reticulata* is related to *C. leiperi* and *C. pearnii* but differs from those species by its red flowers, erect lateral staminodes and ovate to ovate-lanceolate leaves.

***Conservation status*:** *Commersonia reticulata* is conserved in Lumholtz N.P. and is locally abundant due to suckering in its area of occurrence (up to 5 ha: *Forster PIF30680*; up to 4 ha: *Forster PIF30657*). The species is not considered to be at risk although it remains poorly surveyed with only three extant populations known ([1-3] in specimens cited above).

***Etymology*:** The epithet is from Latin *reticula* referring to the prominently reticulate leaf venation that characterise this species.

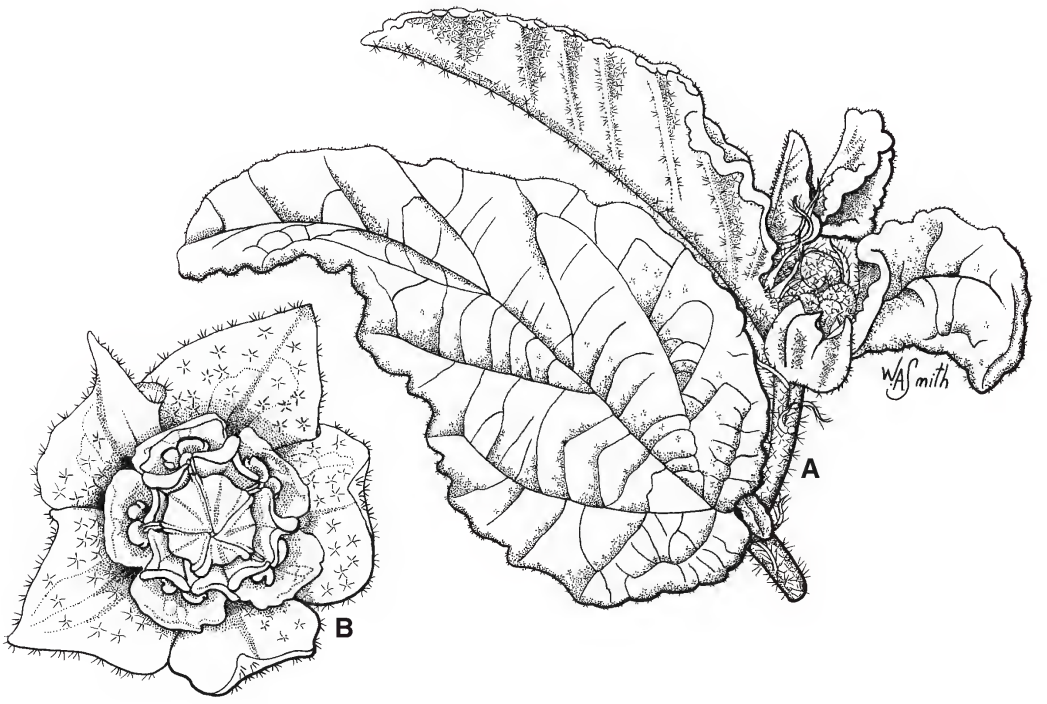


Fig. 4. ***Commersonia reticulata***. A. flowering branchlet. × 1.5. B. flower. × 6. All from *Forster PIF30680* (BRI).

10. Commersonia johnsonii Guymer **sp. nov.** affinis *C. leiperi* et *C. pearnii* sed ab iis floribus majoribus (14–17 mm diam.), petalis longioribus (5.5–6.5 mm) et ovulis 10 per loculum differt.

Typus: Queensland. LEICHHARDT DISTRICT: Zamia Range, 3 km NNW of Springsure, 1 March 1960, *R.W. Johnson 1398* (holo: BRI; iso: BRI, AD, CANB, DNA, K, MEL, NSW).

Commersonia sp. (Zamia Range R.W. Johnson 1398) (Guymer 2002).

Low spreading shrub 0.3–1 m tall, suckering from rhizomes; branchlets yellowish-brown stellate pubescent (hairs 0.1–1.2 mm diameter). Leaves green or slightly glaucous; blades lanceolate or lower leaves occasionally ovate and 3-lobed, (1.5–) 2–10 × 0.5–2 (–2.2) cm; margins crenate, teeth 6–14 pairs, obtuse or rounded, to 1 mm long; bases truncate; apices obtuse; yellowish-brown stellate-pubescent above and below (hairs 1–1.75 mm diameter); 5-veined at the base, venation impressed above, raised below, lateral veins 4–7 pairs; petioles pubescent, 3–12 mm long. Stipules narrowly triangular, 5–9 × 0.5–1 mm, stellate-pubescent. Inflorescences 3-flowered, 12–20 mm long; peduncles 3–4 mm long; axes stellate-pubescent; bracts linear or narrowly triangular, 4–10 mm long. Flowers white to pale pink, 14–17 mm diameter, pedicels 1–4 mm long. Calyces pubescent inside with simple, glandular (0.05–0.1 mm long) and some stellate hairs, stellate-pubescent outside, 7–8.5 mm long; lobes triangular, 4–5.5 × 4.5–6.5 mm. Petals 4.8–6.5 mm long, central lobe ovate, 2–2.5 × 1–1.4 mm, lateral lobes 0.8–1.2 mm long. Staminal tube 1–1.2 mm long; central staminodes triangular, caudate, 2.3–2.5 × 1.1–1.3 mm; lateral staminodes filiform, corniculate, minutely papillate, erect, protruding slightly above anther filament, 0.5–0.8 × 0.12–0.15 mm long. Ovary 1–1.1 mm diameter, with rudimentary bristles; ovules 10 per loculus; styles 0.5–0.6 mm long; stigmas clavate, *c.* 0.15 mm diameter. Capsules 12–18 mm diameter, bristles crinkled, 3–4 mm long and with stellate hairs; seeds 1 or 2 per loculus, ovoid, 2–2.5 × 1.4–1.6 mm, tuberculate with longitudinal ridges, fawn to black; strophiole clear or white, 0.5–0.7 mm long. **Fig. 5.**

***Additional specimens examined*: Queensland.** LEICHHARDT DISTRICT: On road to Fred's Gorge, Minerva Hills N.P., Dec 1996, *Johnstone 709* (BRI); Zamia Range, 3 km NNW of Springsure, Mar 1960, *Johnson 1398* (BRI); 1.7 km W of Fred's Gorge lookout, Minerva Hills N.P., Sep 2005, *Thomas 3015 & Halford* (BRI, MEL, NSW, CANB, DNA, PERTH); Mt Zamia, near Springsure, Jan 1961, *McLaughlin 63* (BRI); *loc. cit.*, Sep 1962, *Story 264* (BRI); *loc. cit.*, Jun 1985, *Young 1050* (BRI); Minerva Hills N.P., W of Gorge Lookout, Mar 1999, *Stephens SP7* (BRI); Mt Zamia, 4 km N of Springsure, Apr 1985, *Rodd 4565* (BRI); Mt Zamia E.P. [now N.P.], near Springsure, Aug 1990, *Bean 2077* (BRI); *loc. cit.*, Mar 1988, *Donnelly s.n.* (BRI [AQ437350]); near Springsure, Jul 1980, *O'Keeffe 14* (BRI); From the cliffs, Springsure, in 1871, *Roth 208* (MEL).

***Distribution and habitat*:** *Commersonia johnsonii* is restricted to Zamia Range in Minerva N.P., near Springsure, central Queensland. It is found in *Corymbia citriodora* woodland (RE 11.8.4a) or shrubland of *Acacia curvinervia* (RE 11.8.7) on Minerva Hills volcanics (plugs, domes and dykes) of alkaline quartz, trachyte and rhyolite on hillsides in shallow stony soils. Other species present can include *Eucalyptus exserta, Acacia curvinervia* and *Alphitonia excelsa* with a grass layer of *Cymbopogon* and *Triodia* species. Plants of this species are common along a 500 m stretch of road, 1.7 km W of Fred's Gorge lookout (M.Thomas *pers. comm.*).

***Phenology*:** Flowers are recorded for March, June to September, December and January. Fruits are recorded for March, April, August, September, December and January.

***Affinities*:** *Commersonia johnsonii* is related to *C. leiperi* and *C. pearnii* but differs from these species by its larger flowers (14–17 mm diameter), longer petals (5.5–6.5) and 10 ovules per loculus.

***Conservation status*:** The species has a restricted distribution on Mt Zamia and its total known populations are contained within Minerva N.P. Further survey work is required to determine its area of occupancy and population numbers.

***Etymology*:** The species is named in honour of Robert William Johnson, botanist and previously Director of the Queensland Herbarium. He collected the type material of this species in 1960 and continues to make significant botanical contributions to our

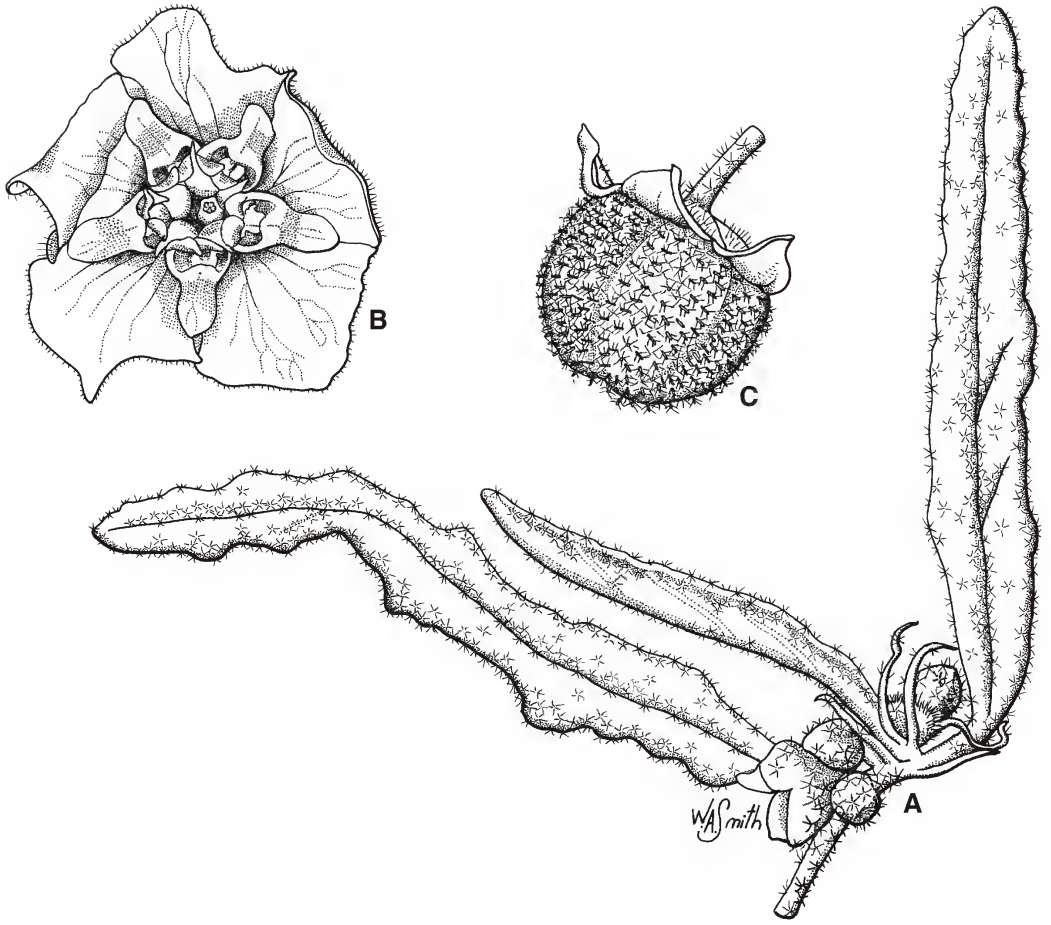


Fig. 5. *Commersonia johnsonii*. A. flowering branchlet. × 2. B. flower × 4. C. fruit. x 2. All from *Thomas 3015 & Halford* (BRI).

understanding of the flora and vegetation of Queensland.

11. Commersonia pearnii Guymer, **sp. nov.** affinis *C. leiperi* sed ab ea foliis glaucis velutinis marginibus valde undulatis et lobis 5–7 rotundatis obtusisve, petiolis longioribus et pedunculis brevioribus (0.9–12 mm longis), differt.

Typus: Queensland. LEICHHARDT DISTRICT: Blackdown Tableland National Park, Charlevue Lookout, 23° 44'S, 149° 02'E, 20 March 2005, *P.I. Forster PIF30624* (holo: BRI, iso: BRI, AD, CANB, DNA, G, K, L, MEL, MO, NE, NSW, P, PERTH).

Shrub 0.3–1 m tall, suckering from rhizomes; branchlets stellate-pubescent (hairs pale yellow, 0.3–1.2 mm diam.), glabrescent. Leaves glaucous, discolorous; blades oblong-ovate, 1.4–5 × 0.8–1.6 cm; margins with 5 to 7 rounded or obtuse lobes 1–10 mm long, markedly undulate; bases cordate; apices rounded; stellate-velutinous above (hairs 0.4–0.6 mm diameter) and below (stellate hairs 0.6–1 mm diameter); 3–5-veined at the base, midvein and lateral veins slightly impressed above, raised below, lateral veins 5–6 pairs; petioles pubescent, 4–10 mm long. Stipules narrowly to linear triangular, 3–6 × 0.2–0.5 mm. Inflorescences 3–8-flowered, 3–5 mm long; peduncles 0.9–1.2 mm long; bracts narrowly triangular, pale yellow stellate-pubescent, deciduous, 2–3.5 × 0.2–0.3 mm; axes stellate-

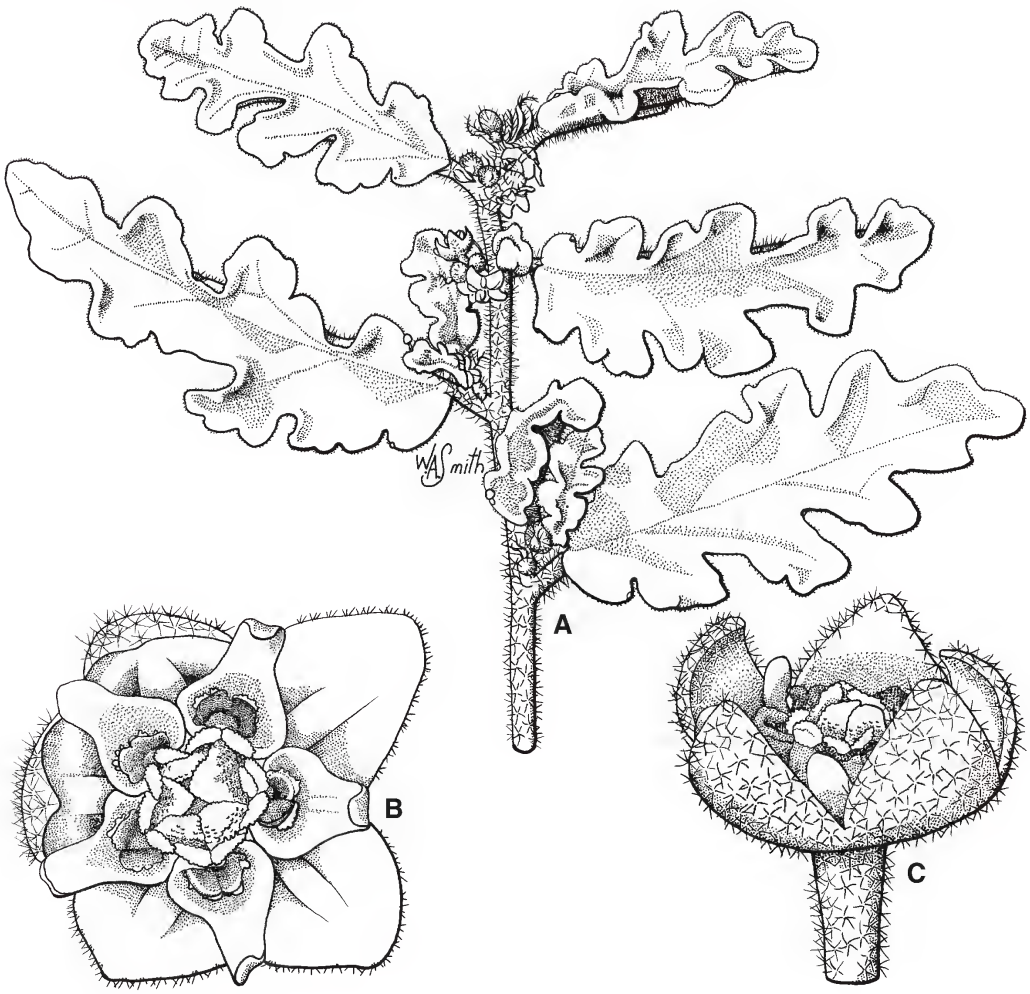


Fig. 6. ***Commersonia pearnii***. A. flowering branchlet. × 1.5. B. flower. × 16. C. opening bud × 16. All from *Forster PIF30624* (BRI).

pubescent. Flowers white, cream to pale green, 4–5 mm diameter; pedicels 0.5–0.8 mm long. Calyx lobes triangular-ovate, 1.4–1.5 × 1.4–1.5 mm. Petals 1.3–1.5 × 1.1–1.2 mm wide; central lobes lingulate, 1.2–1.4 × 1.1–1.5 mm; lateral lobes rounded, 0.7–0.8 × 0.5–0.6 mm. Staminal tube 0.5–0.6 mm long; central staminodes triangular, glabrous inside, papillate outside, 1–1.1 × 0.5–0.7 mm wide; lateral staminodes filiform, corniculate, curved across central staminode, papillate, 0.4–0.5 × 0.1–0.13 mm. Ovary slightly 5-lobed, 0.7–0.8 mm diameter, glabrous or with rudimentary bristles; ovules 3–5 per loculus; styles coherent, *c*. 0.25 mm long; stigmas free, globular, 0.07–0.1 mm diameter. Capsules and seeds not seen. **Fig. 6.**

***Additional specimens examined*: Queensland.** LEICHHARDT DISTRICT: Blackdown Tableland, Sep 1981, *Pearson 384* (BRI); Charlevue Lookout, on Loop Road, Blackdown Tableland N.P., 23° 44'S, 149° 02'E, Dec 1996, *Johnstone 701 & Davies* (BRI, NSW).

***Distribution and habitat*:** *Commersonia pearnii* is known only from Blackdown Tableland and occurs in open-forest (to woodland) with a range of canopy species including *Eucalyptus cloeziana, E. melanoleuca, E. sphaerocarpa, E. suffulgens, E. baileyana, Corymbia bunites, C.*

hendersonii, *C. trachyphloia*, *Corymbia leichhardtii* and *C. citriodora* (RE 11.10.13). It occurs on sandstone scarps and tablelands with shallow soils formed from Cainozoic to Proterozoic consolidated, medium to coarse-grained sediments. The species is locally abundant over about one hectare at Charlevue Lookout (P. Forster, *pers. comm.*).

***Phenology*:** Flowers have been collected in March, September and October.

***Affinities*:** *Commersonia pearnii* is related to *C. leiperi* but differs from this species by its glaucous velutinous leaves with strongly undulated margins and 5–7 rounded or obtuse lobes, longer petioles (4–10 mm long) and its shorter peduncles (0.9–1.2 mm long).

***Conservation status*:** *Commersonia pearnii* has a very restricted distribution being confined to Charlevue Lookout, Blackdown Tableland and the species is conserved in Blackdown Tableland N.P. Survey work is required to determine the species area of occupancy and population numbers.

***Etymology*:** Named in honour of Professor John Pearn AM, RFD, KStJ, Professor of Paediatrics and Child Health at the University of Queensland, doctor, educator, humanitarian and author of medical and botanical works.

12. Commersonia leiperi Guymer, **sp. nov.** affinis *C. pearnii* sed ab ea foliis aureo-fuscis stellato-pubescentia marginibus serratis paribus 6–7 dentium praeditis, petiolis brevioribus (1–2.5 mm longis) et pedunculis longioribus (3–8 mm longis) differt.

Typus: Queensland. Wide Bay District: State Forest 1294, 20 km SE of Childers, 1 February 1996, *K.M. Sparshott KMS744 & R. Price* (holo: BRI; iso: BRI).

Erect or prostrate shrub 0.2–1 m high, suckering from rhizomes; bark brown, lenticellate; branchlets golden stellate-pubescent (hairs 0.2–1.2 mm diameter). Leaves green, paler below; blades lanceolate, 1.5–11.5 × 0.4–1.6 cm; margins serrate, teeth 4–7 pairs, 0.5–4 mm long; bases truncate; apices acute or obtuse; golden brown pubescent above (hairs mid-dense, simple, biramous & stellate 0.4–1 mm diameter), stellate-pubescent below (hairs 0.4–1 mm diam.); 3-veined at base, veins slightly impressed above, laterals and midrib raised below, lateral veins 4–5 pairs; petioles pubescent, 1–2.5 mm long. Stipules linear, 1.4–1.7 × 0.1–0.15 mm. Inflorescences cymose, 3–12-flowered; peduncles 3–8 mm long; bracts linear, 1–2 mm long; axes stellate-pubescent. Flowers white, pink in bud, 4.5–5.5 mm diameter; pedicels 1–4 mm long, pubescent (hairs stellate and glandular). Calyx pubescent outside (stellate hairs 0.2–0.4 mm diameter & red glandular hairs to 0.4 mm long), puberulous inside (hairs stellate & glandular); lobes ovate-acute, 1.5–1.6 × 1.3–1.4 mm. Petals 1.7–1.9 × 1.5–1.7 mm; central lobe ovate, 0.8–1.3 × 0.7–0.9 mm; lateral lobes rounded, 1.6–1.8 × 1.5–1.7 mm. Staminal tube 0.8–1 mm long; central staminodes ovate-acute, 0.8–0.9 × 0.5–0.6 mm, papillate outside and on margins, glabrous inside; lateral staminodes filiform, corniculate, curved in front of central staminode, 0.3–0.4 × 0.2–0.25 mm, papillate. Ovary slightly 5-lobed, 0.75–0.85 mm diameter, with rudimentary bristles; ovules 6 per loculus; styles coherent, 0.4–0.5 mm long; stigmas capitate, coherent, 0.12–0.15 mm diameter. Capsules and seeds not seen. **Fig. 7.**

***Additional specimens examined*: Queensland.** Wide Bay District: S.F. 57, St Mary, 25° 40'S, 152° 25'E, Apr 1996, *Forster PIF19113* (BRI); *loc. cit.*, 25° 40'S, 152° 24'E, Aug 1996, *Forster PIF19501* (BRI, MEL); cult. Beenleigh (ex S.F. 57, St Mary), Mar 1997, *Leiper s.n.* (BRI [AQ654851]); Coonarr Creek, near Elliott River, *c.* 20 km SSE of Bundaberg, *s.dat., s.coll.* (BRI); Wongi Forestry, Childers, Feb 1988, *Randall 502* (BRI);

***Distribution and habitat*:** *Commersonia leiperi* is restricted to a single degree square from just south of Bundaberg to State Forest 57 St Mary, southwest of Maryborough, in south east Queensland. It has been recorded from woodlands and open forests of *Angophora leiocarpa*, *Eucalyptus cloeziana* and *E. acmenoides* in sandy soil (RE 12.9–10.21).

***Phenology*:** Flowers have been collected in February and April.

***Affinities*:** *Commersonia leiperi* is related to *C. pearnii* but differs from that species by its golden brown stellate-pubescent leaves, serrate leaf margins with 6–7 teeth, shorter petioles (1–2.5 mm long) and its longer peduncles (3–8 mm long).

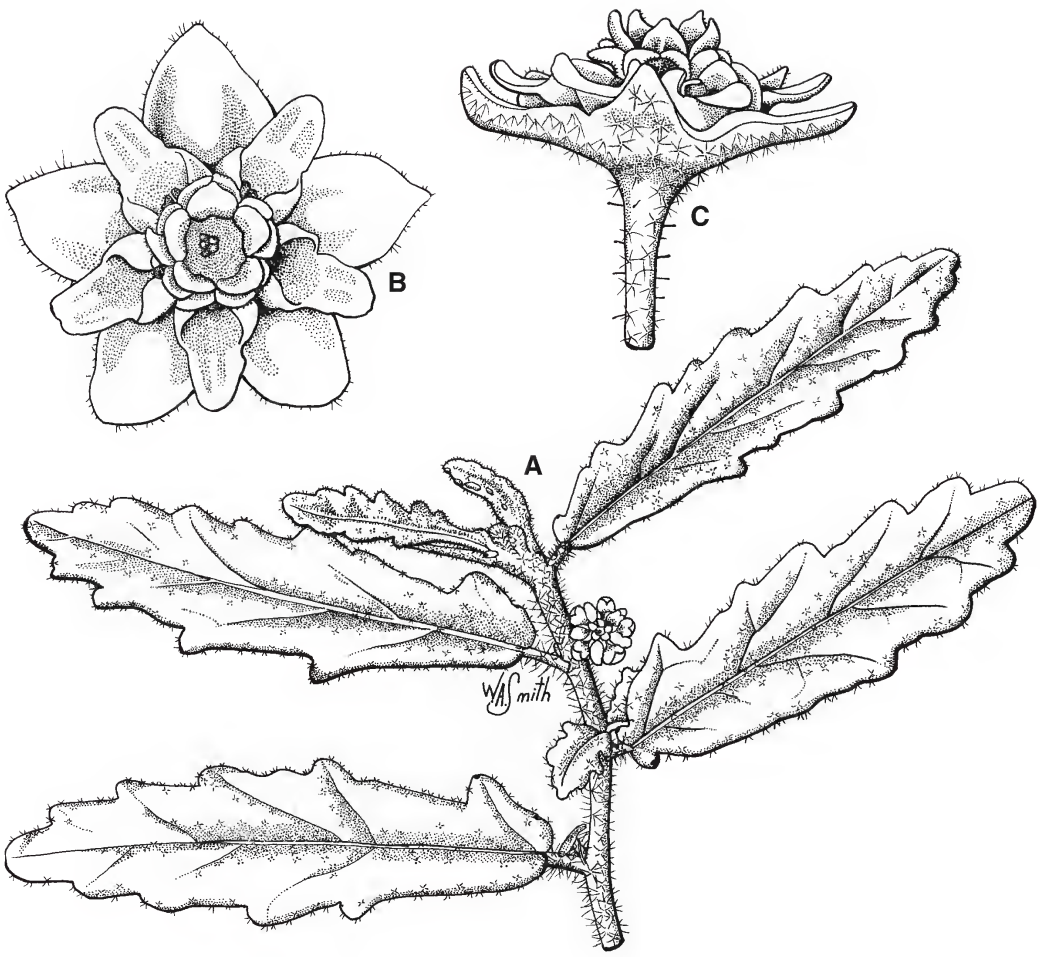


Fig. 7. ***Commersonia leiperi***. A. flowering branchlet. × 2. B. flower from above. × 10. C. flower from the side. × 10. All from *Leiper s.n.* (BRI [AQ654851]).

***Conservation status*:** *Commersonia leiperi* has a restricted distribution of less than 100 km but has significant populations conserved in State Forests. The species requires detailed survey to determine the area of occupancy and number of individuals.

Etymology: This species is named in honour of Glenn Leiper, educator, amateur botanist, photographer and author. Glenn originally discovered this species in State Forest 57 St Mary and has cultivated and flowered it at Beenleigh enabling illustration of the flowers.

13. Commersonia leichhardtii Benth., *Fl. Austral.* 1: 242–243 (1863). **Type:** Queensland: Head of the Boyd river, 29 January 1847, *Leichhardt 574* (lecto [here chosen]: MEL 236401).

Shrubs 0.2–0.5 m tall, suckering from rhizomes; branchlets golden-brown stellate-pubescent (hairs 0.4–1.2 mm diameter), glabrescent. Leaves green or slightly silvery, discolorous; blades ovate to lanceolate, occasionally lower leaves shallowly 3-lobed, 3.5–8.5 × 1–3 cm; margins crenate, teeth 7–22 pairs, to 2 mm long; bases

truncate or slightly cordate; apices obtuse; stellate pubescent above (hairs 0.4–1 mm diameter) and below (hairs 0.6–1.8 mm diameter); 5-veined at the base, midvein and lateral veins impressed above, raised below, lateral veins 5–7 pairs; petioles 4–12 (–14) mm long, stellate-pubescent. Stipules narrowly triangular, 3–12.8 × 0.8–1 mm, deciduous, stellate-pubescent. Inflorescences 3–5-flowered, 1.5–2 mm long; peduncles 5–6 mm long; axes stellate-pubescent (hairs 0.0.6–1.4 mm diameter); bracts narrowly triangular, 5–8 × 0.2–0.3 mm long, stellate-pubescent. Flowers yellow, 12–15 mm diameter; pedicels 1–1.8 mm long. Calyces 9–10 mm long, stellate-pubescent outside (hairs 0.4–1.8 mm diameter); lobes ovate-triangular, 5–6.5 × 4–6 mm, pubescent inside (hairs stellate & simple). Petals 4.5–5 mm long; central lobe ovate, 2.3–2.5 × 1.2–1.4 mm; lateral lobes rounded, 1–1.2 × 1–1.8 mm. Staminal tube 0.8–1 mm long; central staminodes triangular, caudate, 2.5–4 × 1–1.5 mm; laterals erect, corniculate, smooth, 0.5–0.9 × 0.2–0.25 mm. Ovary slightly 5-lobed, 1–1.3 mm diameter, and with rudimentary bristles; ovules 10–12 per loculus; styles 0.7–1 mm long, free; stigmas clavate, free, 0.2–0.3 mm diameter. Capsules and seeds not seen.

***Additional specimens examined*: Queensland.** Leichhardt District: Head of Boyd River [Creek], Jan 1847, *Leichhardt s.n.* (K). Burnett District: Gorge, Oaky L.A., Coominglah S.F., NW of Monto, Mar 1996, *Bean 10147* (BRI, MEL); *loc. cit.*, Jun 1996, *Bean 10414* (BRI). Darling Downs District: Turkey Mt, Barakula S.F. 302, Nov 1987, *Forster PIF15173* (BRI); Barakula S.F. 302, Sep 1996, *Forster PIF19627 & Ryan* (BRI); Turkey Mt track, Barakula S.F., Nov 1984, *R. Hando 370* (BRI); Turkey Mt fire lookout, Barakula S.F., *V. Hando 379* (BRI); *loc. cit.*, May 1985, *V. Hando 380* (BRI).

***Distribution and habitat*:** *Commersonia leichhardtii* is confined to central Queensland from Boyd Creek, west of Taroom to Barakula State Forest, near Chinchilla. It occurs in woodlands or open forests of *Corymbia citriodora*, *Eucalyptus crebra* and *E. acmenoides* on sandstone ridges or stony hillsides (RE 11.7.6).

***Phenology*:** Flowers have been collected in March, June and November.

***Typification*:** The type citation for this name states "Head of Boyd river, *Leichhardt, in Herb. F. Muell.*". Although an unnumbered collection of Leichhardt's was retained at Kew, the numbered specimen in MEL is superior in quality and is used to typify the name.

14. Commersonia pedleyi Guymer **sp. nov.** affinis *C. leiperi* et *C. pearnii* sed ab iis floribus roseis 6–7 mm diam., ovulis 10 per loculum, foliorum marginibus loborum partibus 5–16 praeditis, differt.

Typus: Queensland. Darling Downs District: 13 miles [21.7 km] W of Westmar, 19 October 1959, *L. Pedley 518* (holo: BRI; iso: BRI, AD, K, MEL, NSW).

Rulingia sp. 1 (Stanley & Ross 1986).

Rulingia sp. (Westmar L.Pedley 518) (Guymer 2002).

Low spreading or prostrate shrub to 60 cm tall, 20–150 cm across, suckering from rhizomes; branchlets golden pubescent, glabrescent. Leaves dull green, paler below; blades usually linear-lanceolate to lanceolate, 3-lobed, occasionally ovate and palmate, 2–7 × 0.4–4 cm; margins lobed, lobes 5–16 pairs, 1–4 mm long; bases truncate, cordate, occasionally oblique; apices obtuse or rounded; sparsely pubescent above (hairs simple 0.1–0.3, glandular and stellate 0.3–0.5 mm diameter), stellate pubescent below (hairs mid-dense, 0.2–0.8 mm diameter); 3-veined at base, midvein and lateral veins impressed above, veins raised below, lateral veins 4–9 pairs; petioles 2–5 mm long, stellate-pubescent. Stipules narrowly triangular, 2–5 mm long, stellate-pubescent. Inflorescences 7–10-flowered, 10–23 mm long; peduncles 4–5 mm long; bracts linear, 2–9 mm long; axes stellate-pubescent. Flowers at first white, later becoming pink, 6–7 mm diameter; pedicels 1–3 (–9) mm long. Calyces 4–6.5 mm long, stellate pubescent outside, pubescent inside (hairs stellate, simple and glandular); lobes ovate-acute, 3–3.5 × 2.5–3.2 mm. Petals 4–5.5 mm long; central lobes linear-lanceolate, 2.7–4.5 mm long, apex rounded, 0.3–0.45 mm wide, *c.* 0.5 mm wide at base; basal lobes rounded, 0.7–1 mm long. Staminal tube 1.2–1.4 mm long; central staminodes narrowly triangular, caudate, reflexed, 4.3–4.6 × 0.8–1 mm; lateral staminodes present or absent, filiform, erect, 0.35–0.5 mm long, papillate. Ovary 5-lobed, 1.2–1.3 mm diameter, with rudimentary bristles and stellate

hairs; ovules 9–10 per loculus; styles free, 0.5–0.6 mm long; stigmas 0.1–0.16 mm diameter. Capsules 9–12 mm diameter, with 5 papery protruding upper wings (along sutures) 1.5–2 mm long, bristles slightly crinkled, 1–2.3 mm long with simple and stellate hairs; seeds 4 or 5 per loculus, ovoid, 2–2.4 × 1–1.5 mm, tuberculate, black; strophiole 1–1.8 mm long, fawn. **Fig. 8.**

***Additional specimens examined*: Queensland.** MARANOA DISTRICT: 80 km E of St George, Apr 1984, *Ballingall 1370* (BRI); 44 miles [73.3 km] NE of St George, Aug 1956, *Everist 5832* (BRI); Megine to Brucedale road, *c.* 40 km S of Roma, Sep 1995, *Grimshaw PG2171* (BRI); St George – Bollon road, Sep 1983, *Jahnke s.n.* (BRI [AQ398475]); 56 km NNW of Talwood, Feb 1968, *McDonald 375* (BRI); 3 km E of Yuleba, Oct 1973, *s.coll.* (BRI [AQ11346]). DARLING DOWNS DISTRICT: 1.6 km S of Miles, Mar 1994, *Bean 7582* (BRI); 18.2 km W of Westmar, Moonie Highway, Oct 1984, *Forster PIF1918* (BRI); Miles, Mar 1950, *Gordon DMG155* (BRI); 19.9 km W of Westmar, Sep 2005, *Halford Q8584 & Thomas* (BRI); *c.* 24 km W of Westmar, Sep 2005, *Halford Q8586 & Thomas* (BRI); Gurulmundi, near Miles, Sep 1977, *Hando s.n.* (BRI [AQ264195]); Main Range, near Gurulmundi, Nov 1930, *Hubbard 5111* (BRI, K); Moonie, Dec 1970, *Pedersen CO4* (BRI); Main Range, 3 miles [5 km] W of Gurulmundi, Sep 1961, *Pedley 879* (BRI); 5 km W of Gurulmundi, Jan 1984, *Pedley 5029* (BRI); 10 km from Gurulmundi on Woleebee road, Aug 1977, *Ross s.n.* (BRI [AQ228855]); Glenmorgan, Oct 1969, *Smith s.n.* (BRI [AQ377200, 377339]); 17 km W of Westmar, Sep 1988, *Thomas s.n.* (BRI [AQ477366]); 16 km W of Gurulmundi on Woleebee road, Oct 1973, *Williams 75043* (BRI).

***Distribution and habitat*:** *Commersonia pedleyi* has a distributional range of 160 km from Gurulmundi, north of Miles in the western Darling Downs District, to west of St George, in the eastern Maranoa District, southern Queensland. It occurs in heathlands, woodlands, open forests and along roadsides and is found on sandy soils, red lateritic earths, sand ridges and brown loams.

***Phenology*:** Flowers have been collected in August to January, March and April, and fruits in October, November and March.

***Affinities*:** *Commersonia pedleyi* is allied to *C. leiperi* and *C. pearnii* but differs from those species by its pink flowers 6–7 mm diameter, its 10 ovules per loculus and its leaf margins with 5–16 pairs of lobes.

***Conservation status*:** The species has a wide range of occurrence (160 km) and is conserved in the National Park estate. It is not considered to be risk.

***Etymology*:** Named in honour of Leslie Pedley, botanist and formerly Assistant Director at the Queensland Herbarium, who made extensive collections of the species (including the type) and who first recognised this species was unique and new to science.

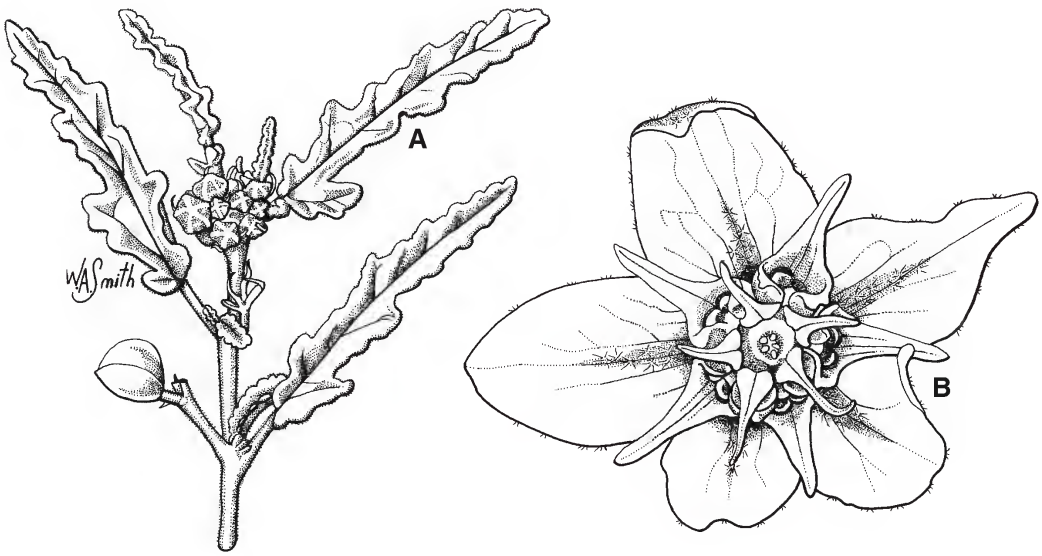


Fig. 8. ***Commersonia pedleyi.*** A. flowering branchlet. × 2. B. flower. × 8. All from *Forster PIF1918* (BRI).

Acknowledgements

I would like to thank the directors and staff of BM, CANB, E, G, K, MEL, NSW, P and W for access to their collections; Will Smith for the illustrations; Peter Bostock for the translations of the diagnoses into Latin; and Megan Thomas, David Halford, Glenn Leiper, Keith McDonald and Paul Forster for their collections of excellent specimens.

References

Brown, R. (1820). *Rulingia pannosa.* In J. Sims (ed.), *Curtis's Botanical Magazine* 48: t. 2191.

Forster, J.R. & Forster, J.G. (1775). *Characteres Generum Plantarum*. White *et al.*: London.

Guymer, G.P. (2002). Sterculiaceae. In R.J.F. Henderson (ed.), *Names and Distribution of Queensland Plants, Algae and Lichens*. Environmental Protection Agency: Brisbane.

Hoare, M.E. (1975). *The tactless philosopher: Johann Reinhold Forster (1729–98)*. Melbourne: The Hawthorn Press.

Holmgren, P.K., Holmgren, N.H. & Barnett, L.C. (1990). *Index Herbariorum. Part 1. The Herbaria of the World.* 8th edn. New York Botanic Garden: New York.

Iucn (2001). *IUCN Red List Categories and Criteria*. Version 3.1. IUCN–The World Conservation Union: Gland/Cambridge.

Short, P.S. (1996). Sterculiaceae. In N.G. Walsh & T.J. Entwisle (eds.), *Flora of Victoria, Dicotyledons.* 3: 324–331. Inkata Press: Melbourne.

Stanley, T.D. & Ross, E.M. (1986). *Flora of south-eastern Queensland.* 2: 87. Queensland Department of Primary Industries: Brisbane.

Van Steenis, C.G.G.J. (1982). Sterculiaceae. In C.G.G.J. van Steenis (ed.), Critical notes on New Guinea plants described by A. Gilli. *Blumea* 28: 169.

Orthographic Corrections

Austrobaileya **6(4): 2004**

p. 616, species **18.**

The correct spelling of the species name, according to Article 23.5 of the current International Code of Botanical Nomenclature, is ***Corchorus subargenteus*** since the specific epithet, according to the author, is derived from Latin *sub-*, somewhat and *argentea*, silvery, and is in reference to the appearance of the foliage of this species. The adjective *argenteus* (W.T. Stearn, Botanical Latin Fourth Edition 1992, p.371) is a Group A adjective which is declined as the stem *argente-* with terminations *-us* (nominative singular masculine case, as in this situation), *-a* (nominative singular feminine case) or *-um* (nominative singular neuter case).

p. 843, forma **6d(ii)**

The correct spelling of the forma name according to Article 24.2 of the current International Code of Botanical Nomenclature is ***Psydrax odorata*** forma ***parviflorifera*** since the forma epithet, according to the authors, is based on "Latin *parvus*, 'small', and *florifer*, 'flowerbearing', [which] refers to the small inflorescence in this form". The adjective *florifer* is declined with terminations *-er* (for nominative singular masculine case), *-era* (for nominative singular feminine, as in this situation) or *-erum* (for nominative singular neuter case) (W.T. Stearn, Botanical Latin Fourth Edition 1992, p.91).

Austrobaileya 7 (1): 1–252 (2005)

Studies in Euphorbiaceae, *s.lat.* 7. *Shonia* R.J.F.Hend. & Halford (*Ricinocarpeae, Ricinocarpinae*), a new Australian endemic genus
D.A. Halford & R.J.F. Henderson 215–228

Cycas scratchleyana F.Muell. (Cycadaceae), a new species record for Queensland and Australia
P.I. Forster 229–230

New species of *Commersonia* J.R.Forst. & G.Forst. (Sterculiaceae) from Eastern Australia and Vanuatu
G.P. Guymer 231–250

Orthographic corrections 251

Austrobaileya 7(1): 1–252 (2005)

Contents

Studies in Euphorbiaceae, *s.lat.* 6. A revision of the genus *Poranthera* Rudge (*Antidesmeae*, *Porantherinae*) in Australia
D.A. Halford & R.J.F. Henderson 1–27

A taxonomic revision of *Tarenna* Gaertn. and *Triflorensia* S.T.Reynolds (Rubiaceae: *Ixoroideae*: *Pavetteae*) in Australia
S.T. Reynolds & P.I. Forster 29–55

A taxonomic revision of *Actephila* Blume (Euphorbiaceae/Phyllanthaceae) in Australia
P.I. Forster 57–97

Studies in Australian Myrsinaceae: *Tapeinosperma* Hook.f.
B.R. Jackes 99–110

Notes on the narrow–leaved Ironbarks (Myrtaceae: *Eucalyptus* subseries *Subglaucae*)
A.R. Bean 111–120

Backhousia enata A.J.Ford, Craven & J.Holmes (Myrtaceae), a new species from north–eastern Queensland
A.J. Ford, L.A. Craven & J.J. Brophy 121–127

Bazzania sauropoda D.Meagher (Marchantiophyta: Lepidoziaceae), a new species from tropical Queensland
D. Meagher 129–133

Gyrostemon osmus Halford (Gyrostemonaceae), a new species from south–eastern Queensland
D.A. Halford 135–139

Eucalyptus erosa A.R.Bean (Myrtaceae), a new stringybark species from central Queensland
A.R. Bean 141–144

Rediscovery and neotypification of *Marsdenia arachnoidea* Schltr. (Apocynaceae: *Asclepiadoideae – Marsdenieae*), an endangered species from Papua New Guinea
P.I. Forster & W. Takeuchi 145–150

Ludwig Leichhardt's Australian Plant Collections, 1842–1847
J.L. Dowe 151–163

Wing structure in seeds of *Strangea* Meisn. and *Stenocarpus* R.Br. (Proteaceae)
H.T. Clifford & M.E. Dettmann 165–170

The rediscovery of *Boronia inflexa* subsp. *grandiflora* (Rutaceae)
M.F. Duretto, P. Grimshaw & K. Sparshott 171–173

New species of *Philotheca* Rudge (Rutaceae) from Queensland
P.I. Forster 175–181

Papuasian Orchid Studies, 2
P. Ormerod 183–203

Goodenia elaiosoma I.D.Cowie (Goodeniaceae), a new species from the Top End of the Northern Territory and a key to the northern species
I.D. Cowie 205–213

(*continued inside back cover*)